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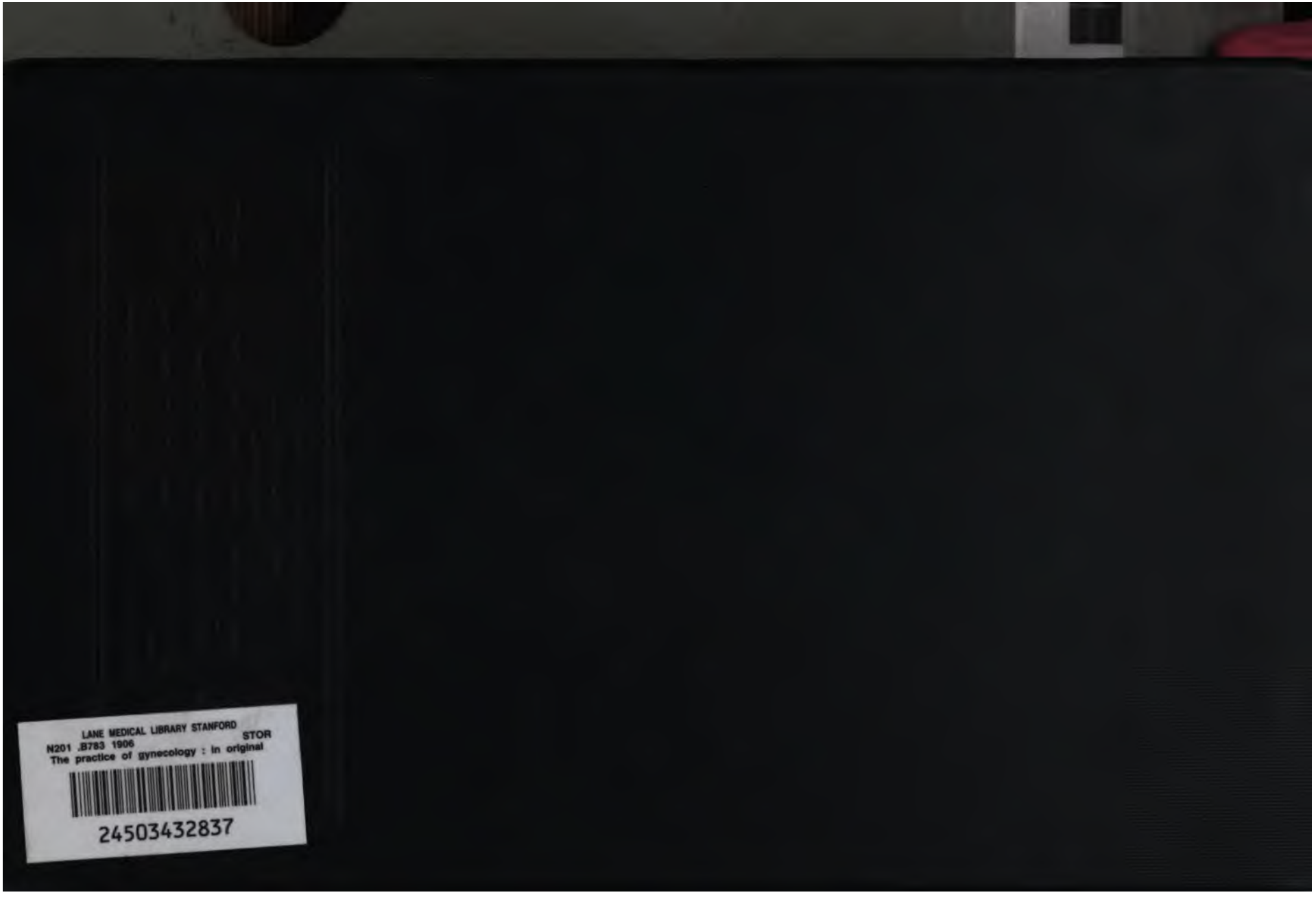
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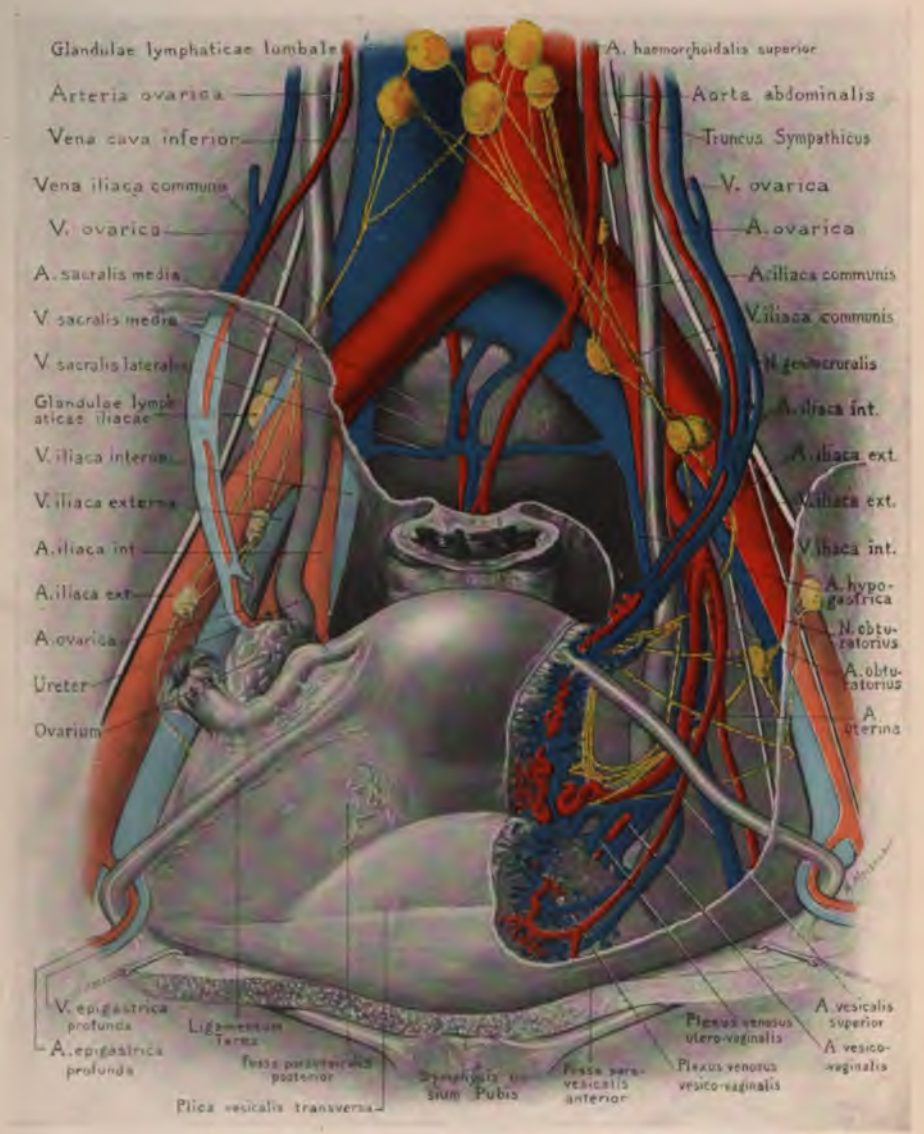

A STUDY FROM NUMEROUS DISSECTIONS AND PLATES. (Dudley.)

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THE

PRACTICE OF GYNECOLOGY

IN ORIGINAL CONTRIBUTIONS

BY

AMERICAN AUTHORS

EDITED BY

J. WESLEY BOVÉE, M.D.

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ILLUSTRATED WITH 382 ENGRAVINGS AND 60 FULL-PAGE PLATES

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1906

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PREFACE.

THE present time seems opportune for the issue of three companion volumes, dealing respectively with Gynecology, Obstetrics, and Pediatrics, and jointly covering this whole cognate domain in the light of the world's latest and best knowledge. This volume is offered to the profession as a practical treatise on the diseases of the generative organs of women and on those of neighboring organs, the urinary system and rectum. Its scope is intentionally made broader than the technical definition of gynecology. The book has been planned to be eminently practical, and in order to make it so due consideration has been given to the conditions actually met by the gynecologist in his work from day to day. It is obvious that in women diseases of the rectum and urinary system are closely related to those of the female generative organs, as those organs are in such a position that the vicissitudes of pregnancy, labor, and the marital relations must of necessity modify the anatomy, physiology, and pathology of the structures both in front and behind the genital tract. One has only to instance the wounding of the rectovaginal septum in labor, or the pressure upon bowel, bladder, and ureters by the pregnant uterus or tumors of the ovaries or uterus, to prove this statement. In a word, an endeavor has been made to place before the medical profession a book that will be of interest not only to the gynecologist and surgeon, but also to the large body of general practitioners. It is no reflection upon the many excellent individual treatises to point out that they can scarcely expect to exhibit the status of the subject as fully as is possible by the collaboration of several accurate observers. To secure the advantage of this breadth of view the present work has been written by seven members of the medical profession of America and under the editorship of one of them.

Each contributor has striven to reflect the results of scientific investigation in an impartial and interesting manner. A departure from the usual classification of diseases has been made in this work, pathology and bacteriology being chosen as the chief guides, in view of the more

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rational and logical arrangement thereby attainable. This will be particularly noted in the consideration of vaginitis, endometritis, salpingitis, ovaritis, and peritonitis.

Wherever clearness, vividness, or more abundant information could be conveyed by illustrations they have been liberally employed both in colors and black. Most of them are original, but the Editor has not hesitated to enrich the series with selections when it appeared that no improvement could be made in their delineation of desired points. He is much indebted to Dr. E. C. Dudley's excellent *Gynecology* for a number of the text engravings and full-page plates.

J. W. B.

WASHINGTON, D. C., 1906.

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PRACTICE OF GYNECOLOGY.

CHAPTER I.

EXAMINATION OF PELVIC CONTENTS.

By X. O. WERDER, M.D.

DIAGNOSIS.

In order to treat a gynecological case satisfactorily and intelligently, a complete diagnosis is of prime importance. It is not always possible to make such a diagnosis at the first examination; in fact, several examinations are often necessary.

As a gynecological examination requires exposure or palpation of the most delicate organs of the female, the examiner must exercise care, tact, and much gentleness in his work. To gain the patient's confidence is the first requisite, as a timid patient is unsatisfactory to examine. For this reason it is always well to converse with her about her condition before even suggesting an examination. The old advice to allow the patient to tell her own story is a good one; and while she may dwell on some features which have no direct bearing on the case, it affords the physician a good opportunity to study the woman's temperament and general condition.

Many patients, particularly at the first visit, are nervous and frightened and are unable to give an intelligent account of the symptoms. The physician here displays his tact by assuming an easy conversational tone in asking the patient questions bearing on her general health, her family briefly, the menstrual and marital conditions, previous disease, age, and gradually ascertaining the present complaints. These interrogations having been made, a more systematic history can be obtained by dwelling more carefully on those symptoms which seem to bear more directly on the present trouble. As most gynecological cases have a multitude of symptoms, it is well to ask what one symptom gives the most concern. In this way less important complaints are eliminated from the history.

There is a great tendency to attribute all complaints of the female to her pelvic organs. In order to avoid this narrow view of the symptoms, it is well to consider the general condition before inquiring into the symptoms referable to the genital organs. Many pelvic symptoms are

often due to extrapelvic disorders, and the differentiation is sometimes difficult. On the other hand, real pelvic lesions may exist and yet cause no localized symptoms.

The relation of nervous disorders to gynecology must always be borne in mind. Many patients will present themselves with a multitude of symptoms having at the same time some real gynecological foundation, but the nervous condition may be out of all proportion to the pelvic trouble. Such cases require not only a careful general examination, but good judgment and discrimination in order to determine to what extent, if at all, the pelvic organs have any bearing on the often extravagant complaints of the patient. In a prognostic sense this is of even greater importance, as by recognizing the true relation of the symptoms and true actual pathological lesion we will be more guarded in expressing an opinion as to the curability of the condition by gynecological treatment, and thus save much disappointment both to the patient and gynecologist.

Neurasthenia and hysteria, conditions as yet little understood, play a very important role in gynecological cases, and are often by far the most prominent features; they frequently persist in spite of the relief of lesions found in the pelvic organs, demonstrating the fact that we should guard against considering all these affections as secondary to lesions of the pelvic organs. Instead of being dependent on the disturbances of those organs, they are often quite independent of them and not infrequently of far more clinical importance than the often slight lesions in the pelvic organs accompanying them.

In making a diagnosis in the female, one fact must always be uppermost in mind, namely, that the majority of women suffer from faulty elimination, which condition gives rise to many symptoms. Careful regulation of the bowels, proper diet, rest, and exercise, and the drinking of large or moderate quantities of water, will cause many symptoms to disappear, and we must, therefore, not be too hasty in making our diagnosis.

Records.—To avoid asking the questions at each visit of the patient, it is most desirable to keep written notes of every case. For this purpose the card index system has proved to be more satisfactory than record books, which are bulky and inconvenient to handle. Loose cards measuring 8 x 8 inches, or other convenient size, are best adapted for the purpose. They are easily accessible and can be added to as occasion requires. Printed forms are of great benefit to the beginner; but for one experienced in note taking, such forms are unnecessary.

Such items as name, date, age, address, occupation, family and previous medical history, social state, menstrual history, pregnancies, and present condition should also be included in the history and carefully noted on the card. At subsequent visits of the patient the card can be quickly referred to and corrections or additional notes made as occasion requires.

The following form has been found of much service for beginners, but for the specialist it is not sufficiently flexible:

Referred by Dr.
Name Residence Date
Age Occupation S. M. W. Gen. appearance
Prev. illness Para Last Miscarriages Last
Labors Condition after conf.
First menst. Last Regularity Duration Quantity
Character of menses Pain before; during; after;
Leucorrhœa Present illness since
Pain (where and when) Headache
Bowels Urination Sleep Appetite Digestion
Other symptoms Dyspareunia
Complains principally about Nerves
Any specific infection at any time
Examination Abdomen Kidneys
Perineum Vag. outlet Vagina Vulva
Rectocele Cystocele Cervix Rectum
Secretions Uterus
Right adnexa Left adnexa
Other conditions
Diagnosis

The reverse blank side of the card may be utilized for notes at subsequent visits of the patient; or the treatment, medical or surgical, may be outlined upon it. Another convenient but more elaborate system of history taking is that of the loose-leaf index ledger, the pages being of convenient size, about 7 x 11 inches. When such a system is used, there is room for additional notes, such as urinary and blood examinations.

Each portion of the history should be carefully elaborated and only such facts that may be of interest should be recorded.

Age.—Age is of much importance and should always be ascertained.

Family History.—Family history, while occasionally interesting, is in the main unimportant. The inherited tendency toward tuberculosis, carcinoma, etc., may be noted, but too much questioning of the patient along such lines is not sufficiently profitable.

Occupation.—Occupation, while not always a causative factor in pelvic disorders, must be considered. Such occupation that requires working in crowded and poorly ventilated rooms and clerking in stores which requires long hours of constant standing, are certainly conducive to ill health in women. Under this, habits may also be considered. It is well known that sedentary living, unsuitable style of dress, and exposure to cold, especially during the menstrual period, all have harmful effects on the pelvic organs.

Previous Medical History.—Many diseases, such as tuberculosis, rheumatism, and anæmia, present symptoms which are independent of the genital tract, yet, as is often the case, are referred to these organs as the primary cause. They often require special treatment when complicating gynecic diseases.

Marital History.—It is always well to know how long the patient has been married, and if a widow, for what length of time. The number of pregnancies, together with any unusual features connected with them; the number of abortions, with the date and causes, are all important and leading questions. As a large percentage of all gynecological cases have their beginning after pregnancy, it is necessary to elicit all facts concerning these conditions. Abnormal or febrile conditions during puerperal convalescence frequently shed much light on subsequent developments in the pelvic organs. While always a delicate subject, reference to the sexual relations must sometimes be made.

Menstrual History.—Ascertain the age at which menstruation was established and the general health at that period. Patients with a markedly delayed puberty, say seventeen to eighteen years, frequently suffer from defective development of the genital organs, and the knowledge of that fact may therefore be of considerable aid in forming an opinion. The same holds good of poor health at that time, as that also interferes with a proper development of those organs. The regularity and duration of the flow, location and severity of pain, should also be inquired into. If the patient has been pregnant one or more times, the type of menstruation has probably changed, and it is well to consider the menstrual history from that time under special heading, with special reference to regularity, duration, and amount of flow; the appearance, whether light or dark, thin or clotted, or offensive. If menstruation is painful inquire into the severity: whether the patient is compelled to go to bed; whether the pain is before, during, or after the flow, as well as the duration and location of the distress.

Present Symptoms.—As has been noted, many complaints of the female are referred to the pelvis when those organs are in perfectly healthy condition. The cause and exact duration of the present trouble is of the utmost importance; particularly is this true of cases having a history of pelvic inflammation. The number and severity of attacks should be carefully inquired into and noted, and also whether this infection is probably of puerperal or gonorrhœal origin. Determine the character and location of the pain, also what influence exertion and rest have on the severity. Under this heading may also be considered symptoms referable to the other organs. Regularity of the bowels, hemorrhoids, digestion, both gastric and intestinal; headache, backache, nervous symptoms, character of sleep and general circulation are symptoms all of more or less importance.

The necessity for a painstaking pelvic examination cannot be urged too strongly in any case in which examination is at all indicated. Only too often are grave pathological conditions given too little consideration, until their destructive effect is apparent to everyone; whereas, had a careful examination been made when early symptoms were presented, much good could have been accomplished. Many patients will object to an exposure of their genital organs, but when impressed with the necessity of such a procedure, and the uselessness of drugs in many pelvic conditions explained, these objections are easily overcome.

While a pelvic examination is the only positive means of ascertaining the exact condition of the female reproductive organs, such an examination should not be made, or even suggested lightly, without careful consideration in cases of young women, particularly virgins. While neoplasms and other serious pathological lesions may be present even in young, virtuous girls, the larger majority of them consult the physician for menstrual disturbances, especially dysmenorrhœa, which, in a large percentage, have no local origin at all, and unless some special indication exists, such as purulent vaginal discharge or persistent intermenstrual pain or other characteristic symptoms, no local examination is needed. Much physical and moral harm has resulted from indiscriminate examination and local treatment of young girls, and the writer could point out dozens of such victims who have unquestionably been seriously injured, morally and physically, as the result of such ill-advised treatment. If an examination is really necessary it should be done under anæsthesia, especially if the examiner is not an expert gynecologist, as that is the only way in which a satisfactory conclusion can be reached by him. The examination should be made per rectum, not per vaginam, to save the hymen whenever possible. If local treatment is found necessary, it should be operative in all cases when indicated, and rarely should we advise local applications which will likely have to be continued over a long period of time. In this respect very much is sinned by physicians against young girls, who are treated month after month and year after year even in cases sometimes where no actual disease in the pelvic organs is present. Such treatment is little short of criminal, and cannot be too severely condemned.

In the case of married women less hesitancy should be shown when the symptoms suggest the possibility of pelvic origin. The finding of a lacerated perineum or cervix, while often the cause of many pelvic symptoms, should not satisfy the examiner, as higher and more serious pelvic lesions may exist and demand radical treatment.

A favorable time, which is usually the intermenstrual period, for gynecological examination should be selected, and too much haste should not be displayed. It is of utmost importance to examine women who are at about the age of the menopause, for it is at that time of life that pelvic symptoms assume grave significance, particularly the occurrence of any unusual bleeding or discharge.

When taking the patient's history it is better to have no friend or relatives present, as the presence of a third party may be the cause of the patient concealing some important facts; at the examination, however, it is advisable to have the nurse or some other trustworthy female present, for obvious reasons.

While it is often necessary to examine a patient in bed, yet it is more satisfactory to do so in one's private office, where all facilities are at hand. An examination in bed is often difficult, for the reason that the bed is too yielding and the proper position can seldom be had. A suitable examining table should be a part of every physician's armamentarium. The chair or table should be strong and durable, and large enough to

allow the patient to assume any of the various positions. It should have foot-rests, cushions, and pillow. For all practical purposes the Buchanan table is well adapted. It is inexpensive, strong, easy to clean, and when necessary is an admirable operating table. Many others, however, answer equally as well, but are more expensive and cumbersome.

FIG. 1

Office examining table.

Good light is essential. A portion of the examining-room should be screened, if there is no dressing-room, for the purpose of allowing the patient to arrange her clothing and toilet. The examining table should be conveniently near running hot and cold water, and close by and out of view of the patient should be arranged a table or stand with an assortment of specula, sounds, applicators, cotton, and medicine for local application. These should all be within easy reach and carefully arranged. The sheet and towels used about the person of the patient should, of course, be scrupulously clean. A pair of sterile rubber gloves and finger-cots should always be prepared. These should be worn whenever the least suspicion of infection exists, as the physician owes such protection to himself and his other patients. The bladder and bowels should be evacuated, and, when possible, a warm vaginal douche should precede

FIG. 2

Buchanan operating and examining table.

the examination. If necessary, the patient should be catheterized and a warm soapsuds enema given in order to render a more thorough examination possible. The hands of the examiner should be thoroughly scrubbed and lubricated when making a vaginal examination.

All unnecessary clothing, such as corsets, heavy skirts, and bands should be removed and the waist freed. The patient should be instructed how to allow the muscles to relax and at the same time she should be assured that the examination will be without pain. Care, gentleness, tact, and consideration of the patient's feelings are essential in making a satisfactory examination of the female pelvis.

Examination.—Examination comprises an investigation of the abdomen, the external generative organs, and the pelvic contents.

Positions.—The patient may be examined in any of four positions, namely: dorsal, semiprone or Sims' position, genupectoral, and erect. The most important of these are the dorsal and semiprone.

The Dorsal Position.—The patient lies on her back, the head resting on a small cushion, the limbs flexed and widely separated, and the heel resting on some suitable support or stirrups. The buttocks should be at the extreme foot of the table, and, if possible, should be lower than the feet in order to secure greater abdominal relaxation. This position is best adapted for abdominal examination and bimanual palpation, and of all positions it has the widest field of employment.

FIG. 3

Sims' position.

The Semiprone or Sims' Position.—The patient lies on her left side and chest, with that side of the face resting on a cushion; the left arm is behind her or hanging over the side of the table; the left leg is flexed partly, while the right is flexed at right angles to the body, and lies on the left leg and table. This is the position to be assumed when we wish to use Sims' speculum, which, for the inspection of the vaginal canal and the cervix and certain forms of local treatment, especially the introduction of tampons, etc., has some advantage over the dorsal position (Fig. 3).

The Knee-chest Position.—The knee-chest position is assumed by having the patient rest on her knees and chest, the left side of the face resting on the left hand. The thighs should be perpendicular to the table and the back hollowed.

This position, especially when assisted by the finger introduced into the vagina, making traction upon the perineum, thus permitting air

to balloon out the vagina, is sometimes of distinct value in replacing the retroverted or flexed uterus, as we bring to our aid the law of gravity. For the introduction of tampons, particularly for the purpose of holding the replaced uterus in position, it is much preferable to the dorsal position (Fig. 4).

FIG. 4

Knee-chest position.

The Erect Position.—The patient stands with the legs separated and the body inclined forward. The examiner introduces the index finger into the vagina in order to determine the amount of displacement of the pelvic organs and the degree of uterine prolapse. The position of the pessary after replacement is felt best with the patient in this position.

Examination of the Abdomen.—In order to make a thorough examination of the abdomen, it is necessary to employ inspection, palpation, percussion, and sometimes also auscultation and mensuration, each of which will be considered separately.

The Regions of the Abdomen.—In order to locate the different abdominal contents according to some definite outline, the abdomen has been divided into various regions. The old division into nine distinct and separate regions, the upper part into the right hypochondriac, epigastric, and left hypochondriac; the central part into the right iliac, umbilical, and left iliac; and the lower part of the abdomen into the right inguinal, pubic, and left inguinal, is unnecessarily complicated and often confusing. Much simpler and more practical is the division of the abdomen into four regions or quadrants by drawing a line from the ensiform cartilage through the umbilicus to the symphysis pubis, which divides the abdomen anteriorly into halves, while the spinal column forms the division posteriorly. A line drawn at right angles to these landmarks, passing through the umbilicus horizontally, completes the division of the abdomen into four distinct zones or quadrants: the right upper and left upper, the right lower and left lower (Fig. 5). Each of these

quadrants forms the surgical landmarks to certain important pathological processes which we look for in these special regions. In the right upper region are found particularly the gall-bladder and pylorus; in the left upper, the stomach, spleen, and splenic flexure of the colon and kidney; the right lower, the appendix, cæcum, and ovary; in the left lower the sigmoid flexure and the left ovary.

FIG. 5

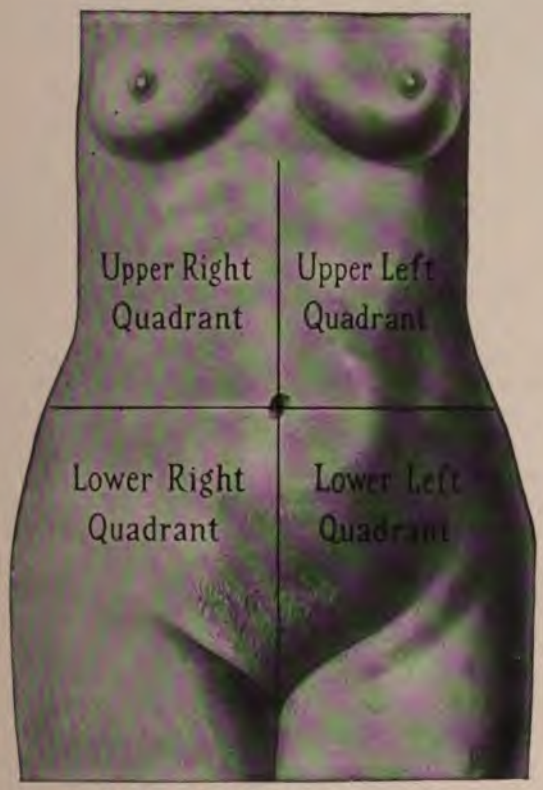


Diagram of the areas into which the abdomen may be divided.

All clothing from the ensiform to the pubes should be removed, a sheet covering the trunk and lower extremities. The patient should lie in the dorsal position upon a table or examining chair, with the legs flexed.

Inspection.—Much may be learned by inspection; the presence of dilated veins, lineæ albicantes, and operative scars are noted. Discoloration from counterirritants may indicate previous inflammatory trouble. The general outline of the abdomen may suggest the presence of ascites, pregnancy, ovarian cyst, or myoma, each of which has certain features which distinguish it. In ascites the abdomen is flattened in the middle and broadened in the flanks; in pregnancy the enlargement is spherical, projecting and in the median line; myoma may present irregular pro-

jections at any part of the lower abdomen, though generally in the centre; ovarian cysts are usually unilateral, and if large may fill the entire abdomen and give to it a dome-shape appearance. A median projection may be an umbilical or postoperative hernia. In favorable cases intestinal peristalsis or fetal movements may be observed. In the upper portion of the abdomen, enlargement or neoplasms of the liver, gall-bladder, spleen, pancreas, stomach, and kidney are often detected by inspection alone. A tumor in the right iliac region is suggestive of an appendiceal inflammatory mass or malignant neoplasm of the colon.

Palpation.—In palpating the abdomen the confidence of the patient must be obtained and her attention diverted by talking or by instructing her to breathe easily. This is done in order to have the abdominal muscles relaxed, and in order to assist in the relaxation the patient should have the limbs flexed and the shoulders and head slightly elevated. The hands, previously warmed, are placed on the abdomen, and by a gentle stroking movement the patient will resist less than when direct palpation is attempted.

Proceeding in this manner, the entire abdomen is carefully explored, first examining the superficial structures, then the deeper organs. The position, density, and mobility of each structure can be determined, as can also localized pain or tenderness. By instructing the patient to breathe deeply the position and size of different abdominal contents, particularly the gall-bladder, spleen, and kidney, can be more easily palpated, as during inspiration they are forced down below the margins of the ribs into the abdomen, where they become accessible to the palpating fingers.

It is often possible to palpate the appendix, especially in thin patients. In order to practice appendix palpation, the patient should lie upon the back with the legs flexed on the trunk. The physician, standing on the right side of the patient, places the finger-tips of the right hand on the patient's abdomen at about a point two-thirds the distance from the middle of Poupart's ligament to the umbilicus (the so-called McBurney point). By palpating deeply, the different structures may be rolled beneath the fingers, particularly the right common iliac artery and the thickened appendix, if present.

The differentiation of various gynecological conditions often necessitates an examination of the kidneys. This can be done with the patient assuming different positions, as standing erect, or with the hands placed on the knees and the body inclined forward. The favorite method is for the patient to lie in the dorsal position with the legs well drawn up. The left hand is placed over the lumbar muscles behind the region of the kidney with the fingers pointing upward, while the right hand, with the palmar surface on the anterior abdominal wall and the finger-tips reaching the costal margin, makes firm pressure against the posterior hand. During deep inspiration the lower pole of the kidney, or, if freely movable, the whole kidney, can be felt descending between the two hands. During expiration it slips away from the hands and

returns to its normal position under the margins of the ribs, unless marked nephroptosis exists.

Percussion.—Percussion is best performed with the patient in the dorsal posture. By this method of examination, we are able to differentiate solid and fluid tumors from abdominal distention due to gas in the intestines, which gives the normal tympanitic sound. It is important to outline the limits of the dull area. Solid or cystic masses produce a dull sound when percussed, but immediately above is an area of resonance. In an encysted accumulation of fluid the dull note will not change, the position of the patient having no effect on it. Free fluid will give a dull note at the most dependent portion as the fluid gravitates there, the percussion note over the intestine above being tympanitic. Fluid accumulation in the abdomen produces a distinct wave of fluctuation if the hand is placed against one side of the abdomen, while the finger-tips strike the opposite side lightly. If the wave is transmitted across the abdomen, the fluid is free or in a large sac; whereas a short percussion wave indicates the presence of fluid in a small sac, as in encysted tuberculous peritonitis. In very fat patients a wave may be transmitted by percussion in the above manner, but by placing the ulnar surface of the hand in the median abdominal line, and then tapping the abdomen lightly in the flank, such a wave will be intercepted if fat is only present.

Auscultation.—Auscultation is performed either by placing the ear directly over the abdomen or by means of the stethoscope or phonendoscope. By this method we are able to recognize fetal heart sounds, uterine souffle, the bruit of pregnancy and of fibroid tumors, intestinal peristalsis, and the movements of fluid and gas in the bowel.

Mensuration.—Mensuration is employed principally for the determination of the size and growth of intra-abdominal masses.

Exploratory Incision.—Exploratory incision should not be done except as a major operation, and the operator should be prepared to perform any radical operation as occasion demands. The incision is usually in the median line and should be as small as possible. The vaginal incision is made generally posterior to the cervix and should be large enough to admit two fingers.

Pelvic Examination.—Having made a careful examination of the abdomen the external genital and pelvic organs are each in turn examined. The patient having been prepared and the clothing arranged as has been described, is placed on the table, usually in the dorsal position. The Sims position is not employed as much as formerly, as bimanual examination can be practised best with the patient in the dorsal position. The necessary requisites for a satisfactory pelvic examination are: (1) cleanliness; (2) tact and gentleness; (3) a suitable examining table; (4) good light; (5) empty bladder and rectum; (6) proper arrangement of clothing; (7) proper position of the patient.

Method of Procedure.—Having removed corsets, superficial clothing, and all constricting bands about the waist, the patient steps on a small stool at the foot of the examining table, raises the skirts behind and sits

upon the extreme lower end of the table. A sheet is thrown over the lower limbs and the patient assisted to lie down, the head but not the shoulders resting on a small pillow. Each foot of the patient is raised by the nurse and the heel placed in the foot-rest or stirrup. A sheet is so draped that the limbs are covered; only the vulva remains exposed. The knees are widely separated and the light and the table so adjusted that the parts are easily inspected.

The different steps in pelvic examination are: (1) inspection of the external genitalia; (2) digital examination of the vagina; (3) bimanual examination; (4) instrumental examination; (5) examination of rectum and bladder.

Inspection.—At the first examination of any patient particular attention should be paid to the external genitalia, not only for diagnostic reasons, but as a matter of personal safety. Venereal infection of any nature should be carefully looked for, and should such a condition be suspected, the examiner should protect his hands with rubber gloves or at least finger-cots. In dispensary practice such protection should always be observed.

Look for the condition of the hymen, whether intact or ruptured; evidences of parturition, such as perineal laceration, relaxation, or cicatrix; the condition of the clitoris and whether adherent; the labia minora, which normally are small, firm folds of tissue, may be elongated and flabby. Note the presence of tumors, vulvitis, urethral caruncles, urethritis, eruptions, cystocele, rectocele, or prolapse of the uterus; also any inflammatory condition of Skene's or Bartholin's glands; œdema and pruritus; at the same time any condition about the anus, such as hemorrhoids, fissure, fistula, or any deviation from the normal.

Digital Vaginal Examination.—While most physicians employ the right index finger for digital examinations it is well to accustom one's self to be ambidextrous, for various reasons. At first, one finger only should be used, and only when the vagina is capacious should two fingers be inserted. As much of the diagnosis depends on digital examination, one should endeavor to educate the tactile sense of the finger-tips as much as possible. The technique of digital examination consists in a thorough cleansing of the examining fingers, and then lubrication with glycerin, mild castile soap, or other non-irritating emollient. If the left hand is used to make the examination, the thumb and index finger of the right hand should separate the labia minora, while the examining finger or fingers, with palmar surface downward, are introduced carefully into the vagina against its posterior wall so as to depress the perineum. In this way we are enabled to determine the presence or absence of feces in the lower bowel; the condition of the perineum, whether rigid, relaxed, or lacerated; the relaxation or narrowness of the vagina; and the condition of the coccyx and sacrum. Any undue tenderness or sensitiveness can also be recognized in this manner. The palmar surfaces of the fingers are directed in turn to the lateral and anterior vaginal walls, noting any abnormalities, and next encircle the cervix. This organ projects into the vagina from its upper portion and

can usually be recognized quite readily. Its size, direction, form, consistency and general outlines are noted. In normal nulliparæ it is round and about the size of the end of the index finger; in multiparæ it is larger, irregular, and usually indented by lacerations. Note the consistency, remembering that in pregnancy the cervical lips are softened. The cervix may have enlarged and everted lips, due to laceration and chronic inflammation; or we may find it enlarged and nodular, due to cystic degeneration; or, in epithelioma, it may be found friable, enlarged, and hollowed out. Cervical polypi or other neoplasms of the cervix or vagina should be looked for. The anus may be everted and the presence of hemorrhoids, fissures, fistula, or ulcers made more apparent. Displacements of the uterus and the presence of pelvic inflammatory masses can sometimes be diagnosed by simple digital examination, but the bimanual method should never be omitted in the diagnosis of such conditions.

FIG. 6

Bimanual or abdominovaginal examination.

Bimanual Examination.—Of all methods this is the most satisfactory, and is really essential in pelvic examination. This is performed by making pressure upward with one or two fingers in the vagina, at the same time making pressure downward with the finger-tips of the other hand placed on the abdomen. In this way the pelvic organs are palpated between the two hands in such a manner that their location, size, form,

and consistency are determined. If the examining fingers are too short, the reach may easily be increased by making firm pressure against the perineum with the third and fourth fingers half-closed. The resistance of the abdominal wall is often difficult to overcome and anæsthesia may even be necessary. Too much emphasis cannot be laid on the fact that the external hand must not exert sudden violent pressure in palpating. Continuous firm pressure will usually overcome this resistance, but it can be further aided by asking the patient to keep the mouth wide open, or to make deep inspirations and quick expirations, or the attention may be diverted by having the patient answer questions while pressure is being made. The pelvic structures may be pushed toward the abdominal wall, but as this is often the cause of much pain or discomfort the better method is to make pressure from above to invert the abdominal wall and pressing the pelvic organs against the finger in the vagina. When the uterus or adnexa are adherent, or when there is an inflammatory condition, too much pressure must not be made, as we may rupture a tubal pregnancy, an ovarian cyst, or a pyosalpinx, or tear adhesions, or, when pregnancy exists, an abortion may result.

Palpation.—In palpating we first note the condition of the bladder, whether full, empty, sensitive, or the seat of a new-growth, or whether the walls are thickened. If the uterus is in normal position, the fundus can be felt immediately behind the pubic arch as a small, freely movable, pear-shaped body, which is continuous with the cervix and moves with it. In anteflexion the fundus is forward and seems to lie immediately on the cervix. In retrodisplacements of the uterus the fundus is found to be absent from its normal position and lies back toward or in the hollow of the sacrum. The distinction between flexion and version will be considered under another chapter. Prolapse of the uterus will be easily recognized by finding the entire organ low in the vagina, depending on the degree of descensus. If the uterus is adherent in any of the positions, its normal mobility will be found impaired or entirely absent. The size, consistency, mobility, and form of the uterus are also to be noted, and the presence of any unusual enlargement or neoplasm is ascertained in the same manner. The palpation of normal tubes and ovaries is not always an easy matter, and persistent practice alone will make one skilled in this particular. Having examined the uterus, the adnexa are palpated by placing the vaginal fingers high in either fornix; at the same time the external hand should be moved from the fundus gradually outward, in this way palpating the cornu and then bringing the tube and ovary against the internal fingers. The ovary can be felt as an olive-shaped body, freely movable at the side of the uterus if normal. If enlarged, prolapsed, or adherent it may be found in Douglas' pouch or at least lower in the pelvis. The tubes are likewise palpated for the purpose of discovering any abnormality, such as thickening, adhesions, or tumor. The broad ligaments, too, are sometimes the seat of neoplasms and require careful attention. In fact, all the pelvic contents should be carefully and systematically explored during the bimanual examination.

Rectal Examination.—There are different combinations of rectal examination, the simple rectal, rectoabdominal, rectovaginal, and rectovaginoabdominal. The finger should always be protected by a rubber glove or rubber finger-cot, and well lubricated before introducing it into the rectum.

By simple rectal touch we may be able to determine such conditions as fissures, ulcerations, and hemorrhoids; also the condition of the sphincter muscle. In the examination of virgins with an intact hymen or patients of a highly neurotic temperament, the rectal or the rectoabdominal examination should always be made.

Rectoabdominal manipulation is performed by placing the fingers of one hand above the pubes and inverting the abdominal wall, while the index finger of the other hand is inserted into the rectum. In this way many conditions not otherwise possible to determine are easily diagnosed, and the posterior vaginal wall, the cervix, and the posterior uterine wall are easily felt, and often the tubes and ovaries, together with the broad and sacrouterine ligaments. Such pathological conditions as certain uterine fibroids, pelvic inflammatory exudates, retrouterine hematocele, and especially malignant involvement of pelvic structures, are best diagnosed by such examination.

By rectovaginal palpation the thickness and strength of the posterior vaginal wall and perineum can easily be determined. Such palpation is performed by placing the index finger into the rectum and the thumb of the same hand into the vagina. When we wish to examine the upper portion of the uterine wall and the broad ligaments per rectum, as, for example, in carcinoma of the cervix, for the purpose of determining the extent of involvement of the surrounding structures, those organs can be made more accessible and brought down lower through the vaginal outlet by making traction on the uterus by volsella forceps. The instrument is held by an assistant while the operator makes a bimanual examination.

The patient is usually placed in the dorsal position for rectal examination, but should the cul-de-sac be filled with intestines, and so make examination difficult, the patient may be placed in the knee-chest position, which will allow the intestines, if not adherent, to gravitate from the pelvis.

Instrumental Examination.—In addition to the methods of examination that have already been given, instrumental examination is also to be considered. It must be remembered that while examination with instruments may be necessary in order to make a positive diagnosis, yet it is to be regarded as a mere adjunct, and we must rely mainly upon our fingers, and particularly upon the bimanual method, in making the diagnosis.

The Speculum.—The speculum is an instrument for treatment rather than for diagnosis, yet it helps to determine the color of the vaginal mucosa, the character of the cervical secretion, and minute lesions of the cervix and vagina which cannot be felt by the examining finger.

The different specula commonly used are the bivalve, Sims', Simon's

and tubular. Formerly the Sims speculum was most commonly used, but its use requires an assistant, which has prompted some advocates of this speculum to use a self-retaining speculum, made according to the Sims model (Fig. 7). For ordinary use the bivalve speculum is preferable, as it requires no holding, and when in position it allows the examiner to use both hands to the best advantage.

FIG. 7

Sims' speculum.

In using the Sims speculum the patient should be in the Sims position, which has been described on page 23. The convex surface of one of the two blades having been lubricated, the handle is grasped in the right hand, the upper buttock is raised with the fingers of the left hand; the blades are introduced with the long axis in the direction of the long axis of the vagina. It is allowed to slide over the perineum, the blades directed backward, but inclined away from the perineum, to prevent the blades from slipping out. As the speculum glides into place, the air rushes into the vagina and distends it. If the vaginal walls are relaxed, it may be necessary to retract them by means of a vaginal depressor. If such an instrument is not at hand, the one handle of an ordinary hemostatic forceps will answer the purpose. Should the cervix be directed backward, it may be grasped by a tenaculum and brought into view. If the Sims speculum is used with the patient in

FIG. 8

Vaginal depressor.

the knee-chest position, the instrument is introduced in the same manner, except that the labia are held apart with the thumb and index finger while the blade is introduced.

The bivalve speculum is the one now most commonly used, and is preferable. It has the distinct advantage of dispensing with an assistant, and as the bimanual examination is usually made with the patient in the dorsal position, it allows the introduction of the speculum without changing the position of the patient. The bivalve speculum consists of two blades with the concave surfaces together. There are several different models of the speculum, and for all practical purposes the Graves and Cusco are well adapted, the former being so constructed that it may be converted into a modified Sims speculum. Three sizes of the bivalve speculum should be at hand, the smallest one being used in examining nulliparous women. In introducing the speculum with the patient in the dorsal position, the labia are separated with the thumb and index finger of the left hand, while the right hand grasps the instru-

ment, the index finger extending along the posterior blade. The right index finger locates the direction of the vagina and the position of the cervix. The blades having been lubricated, the instrument is slowly introduced with the outer surface of the blades parallel with the labia, and so directed downward toward the sacrum that the pressure is made on the perineum and the sensitive urethra avoided. As the instrument enters the vagina, it is rotated so that the blades lie in apposition with the anterior and posterior walls of the vagina. As the blades are separated, the cervix should come into view. If the instrument has not been properly introduced, only the vaginal walls will be exposed, and it is therefore well to remember that for the purpose of proper exposure of the cervix the speculum must be directed well backward toward the sacrum. The exposure of the cervix is more easily accomplished with the Graves speculum, as the handle allows better manipulation after

FIG. 9

Graves' bivalve speculum.

FIG. 10

Weighted vaginal speculum.

the speculum is introduced. If the cervix does not come well into view, a tenaculum introduced into the anterior lip will allow better exposure. The tubular speculum is rarely used except for the purpose of bathing the cervix with medication. It is introduced with an upward and downward motion until the cervix is exposed. The speculum is made of glass, metal, wood, or vulcanite.

Another speculum which has found great favor within the past few years is the self-retaining speculum. It is really a retractor with a weight attached for the purpose of retracting the perineum. For curettement and plastic work on the cervix it is a most valuable adjunct to

the gynecological armamentarium. Of the various kinds used the Auvard self-retaining speculum has been found most serviceable by the writer. Volsella forceps are employed for the purpose of bringing the uterus down toward the vulvar outlet. A decided contraindication to the use of volsella forceps is the existence of any acute inflammatory condition of the pelvis.

The Uterine Dilator.—When it is desired to examine the interior of the uterus it is necessary first to dilate the cervix. For the purpose rubber bags filled with hot water or air, sea-tangle, slippery elm, sponge and tupelo tents are sometimes used, when for any reason the patient cannot take an anæsthetic nor endure the pain of rapid instrumental dilatation. In using any of the above methods, great care must be exercised in sterilizing whatever material is used, as severe infections have often followed their use. Some prefer the introduction of narrow strips of iodoform gauze into the cervix for the purpose of dilating. The round hard-rubber or steel dilators of Hegar or Hanks are of good service when we wish to make gradual and only moderate dilatation. It is well to begin with a small size and gradually increase it, just as in dilating the strictured urethra. When it is desired to stretch the cervix for the purpose of operating or exploration, rapid dilatation under anæsthesia by means of the bladed dilators is most generally used. This instrument, of which there are different models, consists of two blades which, when closed, are small enough to enter the cervix. By means of strong handles the blades are separated and the cervix slowly and carefully dilated to the desired extent. When dilating with this instrument, care must be taken not to exert too much force as the cervix may be torn. The dilators commonly used are Palmer's, Goodell's, Ellinger's and Wylie's.

After abortion or labor the cervix may be dilated by introducing the finger into the patulous os and so stretch it to the desired extent. Dilatation to the extent of enabling the introduction of a finger for the exploration of the uterine cavity has been recommended in obscure cases, but it is certainly rarely indicated, as the sound and curette will usually answer the same purpose and can be used with less injury to the cervix and uterus.

FIG. 11

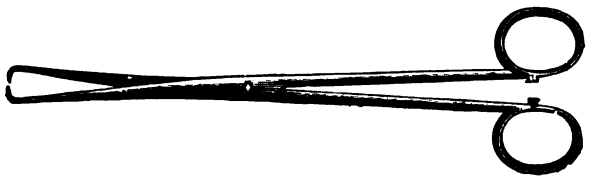
Graduated uterine sound.

The Uterine Sound.—Formerly the uterine sound was very frequently employed, but the bimanual method of examination has dispensed with its use, except in rare instances. The sound should be of flexible metal, the end provided with a small knob, and the upper surface should be graduated for the purpose of measuring the depth of the uterine cavity (Fig. 11).

The chief dangers in the use of the sound are the great liability of infection from the lower genital tract; perforation of the uterus, an accident which, while not necessarily dangerous in the absence of

infection, is particularly liable to happen when the uterus is softened by recent pregnancy or by infection and malignant involvement. If pregnancy exists, abortion is very likely to follow the passage of the sound, and it is for that reason particularly that a bimanual examination should always precede the use of the sound. It is no longer advised to attempt to replace the uterus by means of a sound, neither should the mobility of the uterus be so tested, as severe pelvic inflammation has frequently resulted when the uterus was adherent. The chief indication for the use of the sound is to clear up or confirm a doubtful diagnosis, such as growths closely connected with the uterus or any intrauterine neoplasm; or when the pelvis is filled with masses it may at times be desirable to know the exact position of the uterus, which then cannot be ascertained by the combined examination.

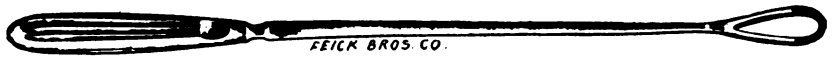
FIG. 12



Tenaculum forceps.

When it is necessary to use the sound the cervix should be exposed through a bivalve speculum, and drawn down by a volsella forceps. The cervix should be carefully and thoroughly wiped off with cotton soaked in a 1:1000 bichloride solution. The sound, speculum, and tenaculum should be sterilized by boiling; in introducing the sound it should come in contact with nothing but the blades of the speculum before entering the cervix.

FIG. 13



Sharp uterine curette.

Uterine Curette.—The curette may be used for diagnostic purposes, particularly to discover the cause of any uterine bleeding, and may, at the same time become a therapeutic agent by removing the cause of the trouble. The curette, while a most valuable instrument, is much abused; and not only is it often needlessly employed, but its use has been the cause of much damage, and a curettement, therefore, should never be regarded as a trivial procedure. The curette should never be used in the presence of an inflammatory condition, and even when the inflammation has subsided care must be exercised. The puerperal uterus should not be curetted except when we are positive that it contains some products of conception, and even then the finger or placental forceps should precede the use of the curette. Perforation of the uterus

with the curette is no uncommon accident even in skilled hands. If the accident is recognized immediately and all further manipulation stopped, no harm will result, but the inexperienced may continue curetting, and almost before he realizes it he may have pulled down loops of intestine and possibly lacerated them.

When a suspicion of malignancy of the uterus exists, no hesitancy should be shown in curetting. The scrapings thus obtained should be submitted to a most careful microscopic examination. In early cases, before other symptoms are presented, this is our only means of making a diagnosis, and such an opportunity should not be allowed to pass, The technique of curettement will be referred to later.

Examination of the Bladder and Ureters.—Examination of the bladder and ureters is performed by means of the cystoscope and its accessories, the dilator, aspirator, head mirror, dressing forceps, ureteral searcher, and catheters. The patient should be in a favorable position, knee-chest or elevated sacral being best adapted for exposure and examination of these parts. (See chapter on Abnormal Conditions of the Urinary Tract in Women.)

CHAPTER II.

DEVELOPMENTAL ANOMALIES OF THE FEMALE GENERATIVE ORGANS.

By J. WESLEY BOVÉE, M.D.

THIS subject is principally of interest to the physician in its relation to modified functions of these organs. It is the peculiar form of menstruation, of pregnancy in such abnormal organs, and the formation of some of the neoplasms in them that make a knowledge of these anomalies essential. They are best considered by beginning with a *résumé* of the process of development of the female generative organs, which briefly is as follows:

According to most embryologists development of the sexual organs in the human fetus is first noticed about the fourth week of gestation, when as solid cords on either side of the vertebral column the Wolffian ducts appear. They become transformed into tubes. They disappear in the human female, though as the ducts of Gärtner they have remained in a few isolated reported cases. The Wolffian bodies soon after appear close to these ducts and extend longitudinally practically the whole length of the peritoneal cavity. They develop rapidly and leave but a small fissure on either side for the ovary, Wolffian ducts, and Müller's ducts. They soon become differentiated from the endothelial coat of the peritoneum and then become hollowed out, forming vesicles. As they grow they become convoluted tubules and connect with arterial tufts nearly the same as the uriniferous tubules and the glomeruli of the adult kidney. They perform the renal function during embryonic life and become transformed into the organ of Rosenmüller, or parovarium, situated in the broad ligament. Early in their formation they become connected with the Wolffian ducts much as the kidney with the ureter. These combined structures sometimes persist in adult life, the orifice being in the vaginal wall or urethra near its external opening. About the time of the appearance of the Wolffian bodies the genital ridges arise from the surrounding masses. Each arises as a thickening of columnar epithelium covering the Wolffian bodies, though on this point all embryologists are not agreed. They become evolutionized into ovaries in the female. Connective-tissue cells form the stroma, while the smaller epithelial cells arrange themselves around the larger ones, forming the ovum with its distinct layer of cells named the membrana granulosa. The largest cell becomes the primordial ovum, while the remaining cells form the membrana granulosa. At the end of the eighth week this is the condition, and the testicle and ovary show absolutely no difference. Now differentiation begins. While in the testicle

the primordial ovum disappears and the epithelium and basic connective tissue cease to develop, in the ovary the primordial ovum enlarges and multiplies, the epithelium becoming more stable, and the connective-tissue stroma to rapidly increase in amount. The primordial ovum sinks into the stroma, infolding with it the epithelial cells, which take their place as a living tunic. Each ovum thus becomes surrounded by a connective-tissue stroma carrying the blood supply and is a Graafian follicle. The large nucleus of the primordial ovum becomes the germinal vesicle. The ovaries change shapes frequently during their developmental period, being long, then flat, bean-shaped, and oval in the order mentioned. From birth to puberty they continue to increase in size, become smoother, and assume the olive shape. They remain up out of the pelvis for several months after birth and occasionally are found above the pelvis in adult life.

The ducts of Müller appear but a few days after the Wolffian bodies are first recognized, and are fully developed as soon as the former. They are thought to be formed from the mesothelium of those bodies, according to Minot. They have at first a triangular area, which later is folded into a funnel to become the ostium abdominale tubaire. This process of infolding, following an advancing solid point, continues until the Fallopian tube and uterine and vaginal portions are formed. They connect below with the sinus urogenitalis. During the seventh and eighth weeks of fetal life the lower portion of the two tubes coalesce, beginning at the lower end, later to be the vaginal orifice, and continuing until the fundus uteri is reached. Sometimes this process of coalescence is reversed, the upper portion of the uterus being the first to unite. At a later period the septum disappears, leaving but a single tube, the rudimentary uterus and vagina. The two upper portions remain, developing into the Fallopian tubes. From this time to the fifth month there is an increase of tissue, especially in the upper portion of the fused canal, which thickens it, rendering the uterine portion distinguishable from the vagina. The upper ends of Müller's duct now expand and form the fimbriated extremities. The upper end of the uterus is still two horns.

At the end of the third month the simple epithelium lining the cavity of the canal changes its character in its lowest third, becoming there a stratified pavement epithelium, which passes over very gradually into the cylindrical epithelium of the upper portion. The change progresses upward according to Minot, and as it advances the demarcation between the two kinds of epithelium becomes sharper. At about the fifth to the eighth month the fundus uteri develops between the two horns. In the sixth and seventh months the uterus increases in size, especially in the cervical portion, which has now become much larger than the body. The palma plicata (rugæ) of the lining epithelium extends very nearly to the fundus and quite to the Fallopian tubes. Transverse elevations in rows are now noticed in the vaginal pavement epithelium. These are the rudiments of the transverse folds. The fundus continues to develop up to the time of birth, but does not at that time equal in size the cervix.

From this time until puberty the uterus remains in this infantile condition. However, the body takes on an increase of size during the second dentition and becomes nearly equal in size to the cervix. With the exception of one longitudinal fold the palma plicata now disappears. Up to this time the cervix has protruded into the vagina but slightly. It now projects a little farther and the uterus settles into the pelvic cavity. At puberty secondary development occurs, which consists in a general increase in the dimensions of the uterus. This is proportionately greater in the body and fundus and they become larger than the cervix. Now the last trace of the palma plicata disappears and the formation of glandular tissue forms in the mucosa. The uterus at this time assumes its adult shape and size. It settles farther into the pelvis and the normal extent of projection of the cervix into the vagina is reached.

In the third week of fetal life the rectum and the urogenital fissure have joined, and by the end of the fourth week these have an outlet on to the surface by means of an invagination of the ectoderm. Soon the cloaca is divided into two cavities by the projection of the tissues from the sides of it meeting, forming a septum, later to be the perineum. The urethra is formed from the lower portion of the bladder; that is, the expanded portion of the allantois remaining in the fetus. The lower end of the fused Müllerian ducts forms the hymen. By the increased development of the vagina the sinus urogenitalis becomes the vestibule.

Fürst has divided the entire period of development into five stages in order to more easily understand the anomalies of these structures. They are as follows: First, from the time of impregnation to the fifth week, and includes the primitive state of the organs until the time when the changes in the sexual glands and the commencing atrophy of the ducts of Müller in the male and the Wolffian bodies in the female show the beginning of sexual differentiation. The septum between the lower portion of the Müllerian ducts still persists. There is a simple cloaca into which the urachus (allantois—later bladder) and the intestine open. At the sixth week the sexual tubercles and folds, and at the eighth week the sexual furrow, have formed, but the parts are as yet sexually indifferent.

The second period extends from the eighth to the twelfth week of fetal life, at which latter period the septum has entirely disappeared. The point of union of the Müllerian ducts has extended upward. The cornu of the uterus is differentiated from the tube, and the point of their union is marked by the insertion of the round ligament. During the second half of this period the cloaca divides by means of the formation of a septum into the anal and urogenital openings.

The third period extends from the twelfth to the twentieth week. The depression at the fundus and the uterine horns has disappeared; the arbor vitæ of the uterus is formed, while the vagina is yet smooth. The orificium externum is formed. The perineum has become large. While the vagina has increased in size, the sinus urogenitalis has

remained so that the bladder appears now to open into the genital canal, instead of the latter being subsidiary to it. The sinus urogenitalis has become the vestibulum vaginæ; the sexual tubercle has atrophied into the clitoris; the sexual folds have developed into the labia majora, and the internal edges of the genital furrow into the labia minora. The perineum has grown and the hymen has been formed.

The fourth period is from the twentieth week to the end of fetal life, and the changes occurring are not so marked as in the preceding periods. The vagina and the uterine and cervical mucous membrane become folded. The development of the vault of the fundus is characteristic of this period.

The fifth period extends from birth to puberty, and is marked by increased thickness of the uterine walls. Up to the sixth year the uterine mucosa gradually becomes smoother and smoother until finally only a longitudinal fold is left.

With this outline of the process of development of the female reproductive organs, we are prepared to intelligently consider the anomalies of these organs.

THE OVARIES.

The developmental abnormalities of these organs are far from numerous. They may be entirely absent, though this failure in development is one of the rarest anomalies in the human body. In most cases in which failure of development of these organs was suspected and in which search for them by abdominal section has been made, they have been found, though rudimentary, in some. In others they have been markedly lobulated. In one case of my own they were scattered in very small, isolated spots over a large area of the broad ligaments, resembling verrucal excrescences. De Sinety found six appendages to one ovary. In one case a perfect left appendage was present, while the right ovary could not be found, notwithstanding the normal surroundings. Many cases in which they were found lobulated have been recorded. This form of abnormal development of these organs is probably that to which belongs those cases occasionally mentioned as "third ovary" ones. One cannot positively state that three normal ovaries cannot develop in one woman, yet such explanation of these cases seems hardly sufficient. Evidence of ovulation may be lacking, and, indeed, failure to find the ovaries by ordinary methods of searching for them may confront us. But these do not justify a conclusion of absence of these organs. Olshausen states that entire congenital absence occurs only in non-viable monstrosities. Rokitansky demonstrated that torsion and constriction may lead to atrophy of these organs. Whenever the ovaries are congenitally absent other developmental errors are present, such as deficient development of parts originating in the ducts of Wolf. Another form of non-developed ovary is that described by some as the primary cirrhotic. It would seem that this non-inflammatory type of a so-called pathological process is but a faulty development in which the connective

tissue of the organ has been developed out of proportion to the functionating area and in consequence markedly limits or completely inhibits ovulation. Nor is diminution in size a necessary feature of this form of anomaly. The Graafian follicles and ovules may be absent and the egg cords of the fetal ovary remain.

FALLOPIAN TUBES.

These structures may be entirely absent, but such a condition is rarely disassociated with some developmental anomaly of the remaining part of the structures developed from the ducts of Müller—the uterus and vagina. There may be, from constrictions from adjacent parts, absorption of a Fallopian tube or rarely of both, or their development entirely prevented. Such conditions, however, are of such extreme rarity as to make discussion of them here inadvisable. For any reason, Courty says, their entire absence is extremely rare, even though the uterus be absent. In uterus unicornis, however, the tube on the defective side is usually absent, the vagina even being formed from the one Müllerian duct.

The tubes may be of unequal length. In 500 autopsies on female bodies Winckel found this condition in 25 of them. In 3 the tubes were from four and one-half to five inches in length. In abdominal surgery it is far from uncommon to find variations of from two to six inches in this measurement of the tube. When such variation is found it is commonly on both sides. Supernumerary tubes of full length are occasionally seen, and branching of the abdominal end into two or more canals, each with its well-formed, fimbriated end, is occasionally met with. Keppler met with one that led to a third ovary. Supernumerary uterine orifices and branches of the uterine end of the tube is less frequently observed. Congenital differences in the formation of the fimbriated ends on the two sides have been observed by Rokitansky, Klob and others. Bandl reports a case of normal-sized tubes which were imperforate throughout their entire length. Olshausen found that some in which the uterine ends of the tubes were well developed, but the fimbriæ were absent and the abdominal end completely closed. As this is a condition very frequently found resulting from pelvic peritonitis some doubt may reasonably be cast upon this condition being one of developmental failure.

The Fallopian tube is frequently met with in a state of arrested development. According to Müller, Paech reported a case in which the right ovary, oviduct, and round ligament were entirely unconnected with the uterus, lay in the right lumbar region, received their blood supply from the aorta, and emptied it into the inferior vena cava. It may have a normal length and normal fimbriæ, but have a canal the lumen of which is much less than normal. This is probably the most frequently met anomaly of this duct. In this connection its undulations and angulations are exaggerated and probably are very frequent causes

of sterility. *Per contra*, the tube may be overdeveloped and have marked patency throughout its entire length. This condition no doubt favors tubal extension of inflammation and infection of the uterine mucosa. Hirst has seen cases of this kind in pregnancy, which conditions may have produced the patency. Displacement of the tubes is far from uncommon. In retrodisplacement of the uterus it is usual. The tube with or without the ovary is found in inguinal hernia. Such cases have been reported by Goepel, Guinard, Lejars and many others. It may be on one or both sides. A number of the reported cases were double and congenital.

THE UTERUS.

Formerly developmental anomalies of the uterus were regarded as freaks of nature, and from the concealed location of the organ they were not scientifically considered until long after the abnormalities of formation of the vulva and vagina had received careful attention. At the beginning of the nineteenth century they were receiving the attention of students of embryology. Müller, in 1830, investigated the process of uterine development and arrived at conclusions that are to-day accepted. Bush, in 1841, in his work on *Sexual Life of the Female*, gave a very good *résumé* of these malformations, and the following year Meissner, in his *Text-book on Female Diseases*, classified them and explained their origin. In the very interesting book Kussmaul published in 1859, entitled *On the Absence, Flexion, and Duplication of the Uterus*, a very thorough description of the various congenital abnormalities of this organ are given and their origin traced. Fürst still later attempted to fix the dates of fetal development at which the various malformations occur, with a fair degree of success. Since overdevelopment of adjacent parts may so produce pressure upon these structures as to interrupt their development, it would seem but reasonable that in many instances the time of interference would be entirely problematic. Thus far the interesting part—the causes of the developmental arrest—has not been elucidated. That such arrest once begun is irremediable is a well-known fact. While it may be remedied in many instances by surgical intervention, in many others such measure must be invoked to save life. An instance might be pregnancy in the horn of a bicornate or unicornate uterus, which is prone to produce rupture of this organ. These malformations may arise: First, from lack of development of the Müllerian ducts; in such case the tubes, vagina, and vestibule will be absent. Second, interference with the approximation and union of the two ducts may occur. As this process usually begins at the lower end we must expect a double vagina whenever such interference in the uterus is noted. Third, nutritive inhibition may be caused by such interference. External pressure or inflammation may cause structural or formative changes. If in but one duct and before fusion and union have occurred, the involved structure may be the only one suffering in formation. It may affect both in a horizontal plane only. Complete destruction may

result from such involvement. Fourth, this interruption may occur before any uterine tissue has formed in the unfortunate part. In this manner atresia and even complete atrophy may result. Probably all these anomalies arise in such manners. Atrophy does not necessarily follow such hindrances, the uterus continuing to undergo some of the other developmental changes. In size it may be perfect. Its shape may arouse no suspicion of abnormality, though it is not usual. One-half of the organ may have full compensatory development for a rudimentary horn or half.

A convenient classification of uterine malformations is:

1. Complete absence of the uterus (defectus uteri).
2. Rudimentary uterus.
3. Absence or developmental anomalies of the cervix uteri (defectus cervicis uteri et cervix uteri rudimentaria).
4. The one-horned uterus (uterus unicornis).
5. The one-horned uterus with rudimentary second horn (uterus unicornis cum cornu rudimentario).
6. The two-horned uterus (uterus bicornis).
7. The double-barrelled uterus (uterus bilocularis or uterus septus duplex).
8. The double uterus (uterus didelphys).
9. The hypoplastic uterus (uterus cordiformis).
10. Positional abnormalities.

Complete Absence of the Uterus.—This is an extremely rare condition and one usually associated with such maldevelopment as acephalia, acardiacus, or other cardiac anomaly that is incompatible with extra-uterine life. Nature seems to always make especial effort that all viable females shall have at least a trace of the uterus. It may be considered a positive rule that a uterus, at least a rudimentary one, is in every living female infant. The difficulty of precise examination leads in many cases to the belief that no uterus of any character was ever present. Careful autopsy in any such case will prove the presence of this organ in some stage of development. The rudimentary bilobed uterus is usually mistaken for the oviducts. Kiwisch mistook a hollow rudimentary uterus for the vagina, and others have thought the very small mass of supravaginal uterine tissue was but an enlarged lymphatic gland. Courty claims to have had a case in which all the internal organs of generation were absent. Others, including Quain and Steglehner, report cases in which no trace of uterus, ovaries, and oviducts could be found. In complete absence of the uterus usually no trace of the Müllerian ducts is present. Even the vagina is usually absent or a shallow pouch presumably from attempts at coitus. The ovaries may also be absent. These conditions arise from interruption in the first five weeks of fetal life. The ducts of Müller were either not formed at all or if development was started it was interrupted early and subsequent atrophy occurred. If the ovaries are also absent, then development of the genital ridge must also have suffered the same fate. In the cases of adults reported there were normal or very small tubes and

ovaries. In these the external genitals were normal, the pelvis wide, the breasts well developed, and the form and character decidedly feminine (Müller). Certain it is that in the autopsied monstrosities in which no uterus was present there was no trace of any part of the Müllerian duct.

Rudimentary Uterus.—A rudimentary condition of the uterus is not rarely found by those accustomed to examining large numbers of women. In this form of maldevelopment the size and shape of the uterus depends upon the stage of formation reached at the time of interruption or the extent of the outer influence toward atrophy or absorption. In the highest degree, that approaching complete absence, it is often mistaken for that condition. In Veit's case there was but a slight thickening in the posterior wall of the bladder. In Langenbeck's case there were islands of uterine elements in the rudimentary broad ligaments. A further development is a smooth band of uterine tissue connecting the Fallopian tubes and the round ligaments, as was noted in Nega's case (Müller). In this case the ovaries were large and long, but were devoid of Graafian vesicles. The vagina was a strip of connective tissue. The labia were strongly developed, the clitoris one inch long, the pubes provided with hair, and the mons with fat. The pelvis was masculine, though the outlet was very wide. The person was strongly built and fat, and the bosom firm. In some cases there are two entirely separate, solid, and vertically placed structures, taking the place of the uterus and called the uterus bipartitus. Should they be joined together they form the uterus rudimentarius bicornis. Another degree, probably less marked, is that in which the cornua are well separated above, and the lower solid portion meets the vaginal roof. This lower portion is usually imperforate and may develop so as to have nearly the shape of the cervix. These structures are practically always solid.

Fig. 14

Infantile uterus.

Other developmental anomalies usually accompany rudimentary uterus. The most common are absence of the *portio vaginalis*, with partial development of the vagina and small, cord-like Fallopian tubes that may or may not be imperforate. The vagina, if present, is usually of very small diameter and shallow. In the cases I have seen this was the condition, though none of the subjects had been married less than five years. With full general anæsthesia I was able in two cases to make out the fold of the uterus and broad ligaments with a crescentic upper border crossing the middle of the pelvis from side to side, as mentioned by Müller, Kussmaul and others. In this anomaly the interruption

has occurred at a later stage of development, as a rule, than in the absent uterus. The ducts have formed, though they have not coalesced. Usually it involves only the median section of them, though it may include the tubal and vaginal portions.

As has been mentioned, the other generative organs may be normal and the individual practically has the resemblance in every way of a woman. Even the voice and psychic development are essentially those of a woman.

As to sexual functions, if the ovaries are well developed there is periodic ovulation. There may or may not be a slight bloody discharge resembling scanty menstruation in quantity, though irregularity as to time is usual. Coital traumatism is sufficient, as a rule, to account for all the flow. In one case that came under my observation severe hemorrhage followed nearly every sexual congress. Vicarious hemorrhages rarely occur from the nose and rectum. Oftentimes the absent vagina accompanying these defects is the cause of the patient seeking the advice of the physician. In such, persistent attempts at intercourse have produced a short, blind depression where the vagina should be, or a much dilated urethra. As in the case of the absent uterus, conception cannot occur. Ordinarily the diagnosis is easily made by examination by the rectoabdominal or vaginoabdominal methods, to which may be added, if necessary, a sound in the bladder and general anæsthesia. In some cases, however, the differential diagnosis between a rudimentary uterus and absent uterus with fairly developed tubes is not clear when based upon palpation alone.

The treatment of this condition will depend upon the inconvenience to the patient. If troublesome molimina be present castration may be found necessary. Tauffer operated for this condition successfully in a woman aged twenty-five years, and Langenbeck, Peaslee, Borner, Savage, Kleinwächter and others report similar cases. Leopold extirpated the rudimentary uterus of a woman twenty-eight years of age.

Absence or Developmental Anomalies of the Cervix Uteri.—These terms are employed to designate those anomalies of the uterus depending upon atresia of the genital canal at the place where the cervix and upper portion of the vagina are developed. This condition varies from slight atresia of the otherwise normal cervix, which might be considered the lowest type of anomaly, to complete absence of this portion of the uterus, the highest type. In the atresia of the canal there is usually some degree of lack of development of the mucosa and an anteflexion of the uterus. The shape of the cervix may be small and pointed, the so-called conical cervix. It may have a very small external os—the pinhole os—and the atresia may be common to the entire canal. This portion may be devoid of the portio vaginalis, the cervical canal entering the level vaginal roof like a fistula; or it may be miniature in size, resting on the vaginal roof and entirely solid. It may be entirely absent, the body of the uterus resting upon the vaginal roof. The body of the organ in such a case may be either solid or have a cavity of even unusually large dimensions. When marked defection of the cervix is present

anomaly of the body may be expected. Atresia of the cervix is by no means always a congenital condition. Acute exanthemata, hot vaginal douches, and cauterization of the cervix may and often does produce atresia. Injuries in labor or abortion, especially if infection be added, occasionally ends in complete atresia of the cervix. It is by no means a rare condition after the menopause. From ulceration, chronic inflammation, or other apparently innocent condition, the canal becomes closed and secretions are penned in the uterine cavity, demanding exit. Hirst mentions meeting with atresia, from some inexplicable cause, in a

FIG. 15

Hypertrophic elongation of the cervix uteri.

woman of forty years. A large amount of blood was immured in the uterus and tubes. Hypertrophy of the cervix may occur and may involve the whole of the cervix or the vaginal or supravaginal portions. It is often of congenital origin, and may be so extensive as to force the protrusion of the cervix through the vulva. A very rare condition is a double cervix with a septum of either the body of the uterus or of the vagina.

In the conditions of absence or marked atrophy of the cervix, absence of the canal or double canal, the development has been interfered with after the coalition of the two Müllerian ducts, and hence after the

second month of fetal life. The anomalies of less extent may occur at even a later stage of development, or, as mentioned, during adult life. The diagnosis is made by bimanual examination and the use of the uterine probe or sound. If atresia of the vagina is present, as occasionally is found, the rectoabdominal method will be needed. A sound in the bladder may be of assistance in determining the presence of a supravaginal cervix or absence of it. The practical interest of cervical anomalies lies in their relation to menstruation and sterility.

As to menstruation it is, first, regarding its passage through the cervix; second, as to whether discharge of menstruation accumulates in the uterine cavity or pours into the oviducts or even through them into the peritoneal cavity; third, as to the presence of dysmenorrhœa. If the cervix be absent the uterine cavity may still communicate with the vagina and therefore exit for the menstrual discharge be possible. If it be solid, or in its absence no connection between the uterine cavity and the vagina exist, then the menstruating uterus will cause an accumulation within the organ to be formed with reflux along the tubes into the peritoneal cavity. This condition demands the formation of a vaginal outlet or some radical operation, consisting of hysterectomy, extirpation of the ovaries, or both, to prevent recurrence, or to remove organs already damaged by reflux. If the canal be pervious and yet some condition slightly abnormal exist, as atresia of one or both ends of this canal, then thorough dilatation may be required, especially if menstrual pain can fairly well be attributed to the condition. Uterine curettage is usually required in addition, as retained uterine discharges have caused inflammation of the corporeal endometrium. The dilatation should be done under a general anæsthesia, and the same may be said of curettage.

FIG. 16

Hypertrophic elongation of the cervix with prolapsus uteri.

Sterility frequently impels women, subject to these anomalies, to invoke the aid of the gynecologist. Pregnancy rarely occurs if the cervix varies much from normal. If the cervix be but slightly deformed and no other cause of sterility be present, thorough dilatation and curettage

are advisable. Should the degree of deformity be great, then the advisability of such treatment may justly be questioned. If menstruation be absent, no doubt should remain, as little benefit could be expected.

The One-horned Uterus (Uterus Unicornis).—In this condition the uterus may have a normal-sized cervix, though this is rare; the body gradually tapers upward and merges into one Fallopian tube. Careful examination usually shows the products of the Müllerian duct on the opposite side are absent. The virgin vagina is unusually narrow, the cervix small, the tube absent, and even the ovary not present. An interesting complication is the frequent absence or anomalous condition of the kidney and ureter on the affected side. This shows the interference was within the first eight weeks of fetal life, else it would not have prevented development of the urinary organs, the ovary, and the Müllerian duct. The uterus usually curves upward to one side and at its apex has attached a round ligament, an ovarian ligament, and a Fallopian tube. In spite of all these things it is usually a functionating uterus, though difficulty in delivery is common. On account of the narrowness of the uterus the fetus usually stands erect in it. This organ generally has less muscular ability and instrumental delivery becomes necessary. Moldenhauer had a pregnant one-horned uterus to rupture. Occasionally a rudimentary Fallopian tube is present on the undeveloped side. The diagnosis of this condition is made by bimanual examination and, if necessary, the uterine sound. If the uterus be pregnant generally the diagnosis will be merely conjectural, if, indeed, even suspected. If the diagnosis be made of a pregnant one-horned uterus, then proper regard must be had for possibility of rupture of the uterus during labor and of postpartal hemorrhage from muscular deficiency.

The One-horned Uterus, with Rudimentary Secondary Horn (Uterus Unicornis cum Cornu Rudimentario).—In this condition we have that just described and in addition projecting from its convex side a rudimentary horn. It may be round, solid, and small, and the subserous portions may be detached from the uterus and ovary. It may be but a thin, band-like strip of muscle. It may have thickened ends or may terminate in a hollow body connecting with an oviduct and having a round ligament and ovary attached. This variety is one that stands between the one-horned and the two-horned varieties. If the rudimentary horn is solid the uterus is from a practical standpoint one-horned. If it be hollow and an ovary of that side present, pregnancy may occur in this horn, with danger of abortion and especially of rupture. This is apt to result more seriously than rupture of the pregnant Fallopian tube, owing to its larger bloodvessels. In fact, it is usually fatal, though Chiari reports a case in which successful encapsulation occurred. Rarely rupture does not occur, the ovum becoming blighted, then desiccated or calcified. Pfeffinger and Fritze recorded such a case in which suppuration ensued more than thirty years later. If the outlet be very small and menstruation on that side occurs, hæmatometra and hæmatosalpinx may result. This was demonstrated by Frankenhaüser's

case. Even if menstrual flow is absent on this side, a cavity, if it exists, may become distended by detritus or pus. It is possible these conditions may interfere with labor in pregnancy of the normal horn, as was experienced by Borinski and Müller.

The diagnosis is difficult without viewing the structures. Then the relation of the round-ligament attachment is the essential point to be noted. This ligament is practically never found attached to an oviduct. It may easily be mistaken for a small pediculated fibroma, springing from the convex side of a one-horned uterus, or from an ovary. In preg-

FIG. 17

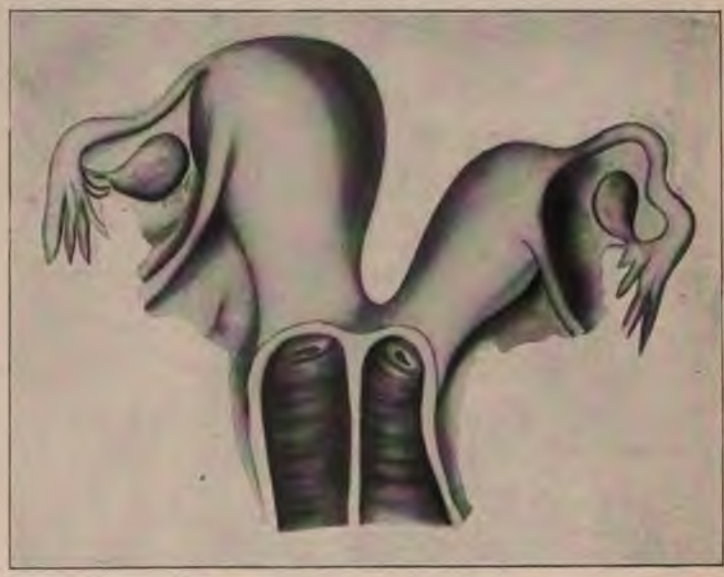
Bicornate unicervical uterus.

nancy of the rudimentary horn a diagnosis of fibromyoma or ovarian tumor is excusable unless a double vagina or double cervix is present. After the pregnant horn is emptied the differentiation will be easier.

Treatment.—No treatment is required if the rudimentary horn is impervious, but, if hollow, retained menstrual fluid or mucus and other detritus may require surgical procedure. This may be in some cases through the cervix or posterior vaginal fornix or by the abdominal route. If the tube is involved, abdominal section will ordinarily be preferable. If pregnancy in the rudimentary horn occurs, abdominal section should be made as early as possible.

The Two-horned Uterus (Uterus Bicornis).—In this variety the cervix is perhaps perfectly normal in size and appearance, though it is often a little broadened. There may or may not be a septum in this part of the uterus. The body, however, has a septum projecting downward toward or quite to the cervix. The rounded fundus is absent and in its place on the outer surface is seen a wedge-shaped depression. The vagina may also be double. Usually the two uterine horns are not equally developed. In this condition menstruation is apt to be irregular, occurring at different times from the two sides, especially if the septum is complete. Pregnancy may occur in either or both horns. Usually, but not always, menstruation ceases when one horn is pregnant. Frequently atresia of one side is present and leads to conditions already

FIG. 18



Uterus didelphys, with double vagina.

mentioned. Pregnancy and labor are usually normal. Pregnancy of both halves, however, differs from the twin pregnancy in the normal uterus because of the septum. Postpartum hemorrhage may occur if the placenta be implanted to any extent on to the septum.

The Double-barrelled Uterus (Uterus Bilocularis or Uterus Septus Duplex).—In this variety of maldevelopment the uterus somewhat resembles a double-barrelled gun, inasmuch as it is composed of two parallel tubes joined by a thin strip of tissue throughout their length. These tubes comprise the cervix as well as the body of the organ and the septum may extend to the hymeneal ring. If it extends only to the internal os, the condition is termed uterus bilocularis unicollis. If not so far down from the fundus it would be called uterus bilocularis unicor-

poreus. Many transitional conditions between the uterus bicornis and uterus bilocularis are found. Of the biloculate uterus, both sides are rarely developed to the same degree. The transverse diameter of it is increased, but dimensions are nearly normal and the septum is apt to be imperfect. The functional activity of this kind of uterus is about the same as that of the bicornate, and pregnancy of one barrel causes peculiar varying shapes of the organ.

Diagnosis.—The diagnosis is far from easy by ordinary methods. A uterine sound in either barrel will much assist in bimanual examination. The same dangers may be met with in this condition as in uterus bicornis.

FIG. 19

Uterus didelphys, showing the two cervices presenting in the vaginal vaults.

The Double Uterus (Uterus Didelphys).—In the double uterus both halves have developed entirely independently of each other and have absolutely no connecting structure except the roof of the vagina. Biloculate uterus might be considered a higher degree of development than this, and a still higher transitional stage the uterus bicornis. In

the case of the double uterus each commonly opens into its own vagina, which in turn opens into the bladder, the cloaca, or, rarely, the rectum. Müller says they more commonly open directly into these cavities without the intermediation of vaginæ. They are usually hollow, but may be solid, and would then be considered as being a uterus rudimentarius bipartitus. The bladder, urachus, and rectum commonly lie between the widely separated uterine structures. Of course, each commonly has its one Fallopian tube. This anomaly is very rare, though genuine cases have been reported by Ollivier, Bonnet, Heitzmann and others.

The diagnosis of this deformity in the living subject is not easy, though if sounds introduced into the two cavities show the halves to be freely movable and widely separate, perhaps one canal longer than the other, and bimanual examination show no structure between them, such condition may be reasonably inferred. It is necessarily a result of the developmental interruption before the end of the eighth week, as then coalescence of the Müllerian ducts is perfect. Nothing in the treatment of this condition needs mention here, as it does not specially vary from that of the various forms of persistent duplicity already mentioned.

The Hypoplastic Uterus (Hypoplasia Uteri).—This form of maldevelopment consists in a partial but not complete development of all parts of the uterus. In some cases the organ in the adult has the characteristic shape of that of the fetus and is called the uterus fetalis. It is very rare. The cervix is larger than the body and the organ is practically anvil-shaped. It is often bent forward to such extent that the body rests upon the cervix. The palma plicata extend into the body and the internal os is indistinct. In others the body exceeds the cervix in size and the walls are extremely thin. This form of anomaly of development has been termed congenital hypoplasia.

In another form the fault is alone in the size of the organ. Various transition stages between these classes are met with. These deformities are no doubt closely associated with the small anteflexed uterus having a small canal seen in adults. The agents causing these varieties of lack of development must be active only after the twenty-fourth week of fetal life. Whether nutritive disturbances just preceding birth or during childhood is the real cause is a question. Epilepsy and hysteria, cretinism, rickets, and tuberculosis have been considered in this connection.

The symptoms usually appear at puberty and consist of amenorrhœa, with, perhaps, menstrual molimina; such symptoms associated with monthly pelvic congestion, as vomiting, diarrhœa, cardiac palpitation, headache, etc.; vicarious hemorrhages, and, when the deviation of development is slight, dysmenorrhœa. Sterility is usual. The treatment would clearly be to remove any of the conditions present that might be considered causes and to stimulate the pelvic circulation by certain exercises or by faradism.

A few other deformities of this organ might be mentioned, as uterus cordiformis, in which the fundus is concave, giving the uterus the heart-

shape, and in which a septum is usually present; and uterus incudiformis, in which the cornua are prominent laterally without concavity of the fundus. These are more interesting to the obstetrician.

The double-mouthed cervix is an interesting condition in which a septum divides the lower portion of the cervical canal into two lateral parts.

FIG. 20

Uterus cordiformis.

Positional Abnormalities.—These consist principally of obliquities in which the broad ligaments are faulty or one-half of the uterus may be less developed than the other. Unilateral atrophy may cause it. Faulty attachments of the uterosacral and uterovesical ligaments may cause

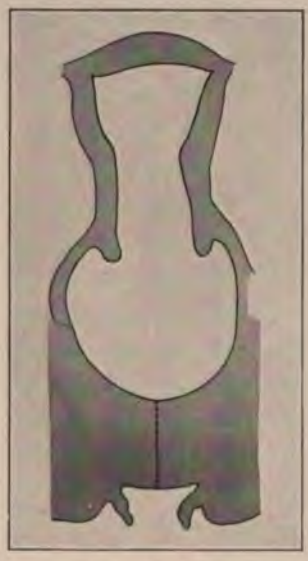
retrodisplacements. Adhesions in childhood or even in infancy may prevent the uterus assuming its natural position.

The treatment consists of massage, correcting circulatory deficiency, and, possibly, surgical intervention in cases in which the symptoms are sufficiently marked.

THE VAGINA.

There may be complete absence of the vagina. It may also be a mere column of connective tissue. Either of these conditions is commonly associated with anomalies of the structures developed from the remaining portion of the Müllerian ducts—viz., the uterus and oviducts. In

FIG. 21



Atresia of the lower vagina.

FIG. 22

Method of stitching vaginal walls to vulvar skin, for relief of atresia vaginæ.

fact, the whole internal genitalia may be absent and the external genitals appear perfectly normal. Even the hymen which is not formed from the Müllerian ducts may be present. Atresia of the vagina may be present in any portion of its length, and varying in extent from complete occlusion to the merest membranous structure. As mentioned in anomalies of the uterus, there may be marked atresia of a part or the whole of the vagina. There may be a longitudinal septum running anteroposteriorly or nearly so and dividing the canal into two compartments constituting the double vagina of embryologists. This condition may or may not be associated with double uterus of any character except the unicollis. The septum may be cribriform or, in places, entirely absent, and the hymen is usually double if the septum joins it.

FIG. 23

Atresia of the vaginal outlet; hæmatocolpos.

FIG. 24

Atresia of the lower third of the vagina.

FIG. 25

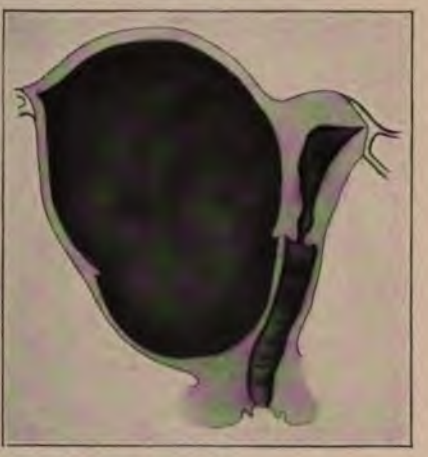
Atresia of the vaginal outlet; hæmatocolpos and hæmatometra.

FIG. 26

Atresia of the lower two-thirds of the vagina; hæmatocolpos and hæmatometra above atresia.

The vagina may be unilateral, having developed from but one Müllerian duct, and is usually associated with uterus unicornis of the same side. In this condition the lumen is about half the normal size, and it is to one side of the median line. On account of the functions of the vagina in relation to drainage of the uterus and to parturition these anomalies are of no little importance. If menstruation occur and an obstruction in the vagina does not permit its exit, it accumulates, distending the uterus oftentimes to a remarkable extent, and in extreme cases the Fallopian tubes are distended or act as outlets for the uterus, pouring the material into the peritoneal cavity. This condition of hæmatometra and, perhaps, hæmatosalpinx may be complicated by hæmatocolpos if any portion of the vagina above the obstruction is patulous. The lower the obstruction the nearer the vulva will be the accumulation of blood. Even if menstruation does not occur and the uterus secretes mucus, this may also form a troublesome accumulation. Of course, sterility is necessarily present in these conditions. Atresia of the vagina if near the outlet acts as a barrier to coition. So long as a very small canal remains by the barrier conception may occur, and, too, an outlet for uterine discharge is afforded. The relation of constrictions and septa of the vagina to parturition is important, as either may prevent passage of the fetus through it. The diagnosis of these conditions is not difficult. The absent vagina is recognized by attempt at vaginal examination and, if necessary, rectal examination with the bladder sound in place. If the uterus be distended by blood or other material it will readily be discovered by palpation; besides, the patient gives a history of several attacks of menstrual molimina without menstrual flow. If the mass is large it may be depressed to near the vulva and be confounded with vaginal atresia, in which condition the thickness of the restraining septum is thinner, the degree depending upon the amount of vaginal length involved.

FIG. 27

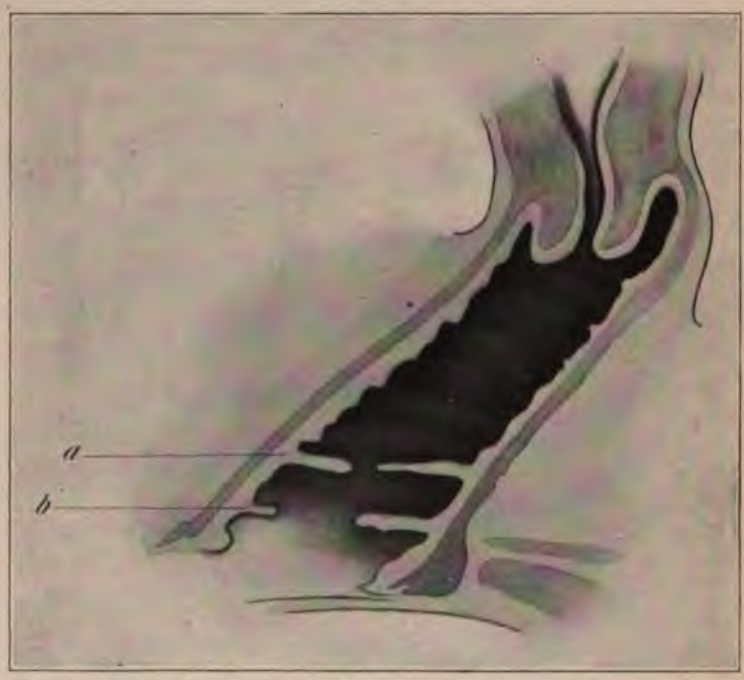


Unilateral atresia vaginæ, with hæmatocolpos and hæmatometra, in uterus didelphys.

Atresia of the lower part of the vagina may be confounded with imperforate hymen if hæmatocolpos is present. However, the thin, bulging membrane in the latter condition having a purplish or brown color should readily be recognized by the accustomed gynecologist. With the hymen permitting passage of a finger or even probe into the vagina no doubt should be left. This point obtains as well in the absence of blood or other fluid in the vagina. If the uterus and cervix

can be felt upon bimanual examination and not by a finger introduced into the vagina, then one or two conditions exist. Either the cervix is deficient in that it has no portio vaginalis, or atresia of the vagina below the cervix is present. Both of these may be coincident. Vaginal septa are not always discovered on examination, nor is this inexcusable. In a married woman one vagina may be well dilated by intercourse and the other closed by a normal hymen. The speculum or finger readily passes into the vagina, and unless a double uterus is noted the second vagina may escape observation. It is when some abnormality of function occurs on that side that the second vagina is discovered. While

FIG. 28



Incomplete transverse septum of the vagina: *a*, septum; *b*, hymen.

most apt to occur on the side corresponding to the vagina used in coitus, yet pregnancy may occur through the one unnoticed. As double vagina is commonly associated with double uterus, and as the latter condition can usually be determined by bimanual examination, one should always suspect double vagina and carefully search for the introitus of each. If both vaginæ are of fair calibre the presence of a septum can readily be determined. In fact, the woman has usually already discovered it. Oftentimes the septum acts as a barrier to delivery.

The treatment of the developmental anomalies of the vagina depends upon the complications. In absence of the vagina nothing is necessary

unless menstrual fluid or other material is pent up or, in rare cases, if cohabitation is impossible and removal of this defect is demanded by husband and wife. If the uterus is solid, accumulation of fluids is

FIG. 29

Occlusion of the vagina by transverse septum.

impossible, and surgical intervention looking toward establishment of an artificial vagina is not demanded. On the contrary, removal of the uterine appendages may be required on account of the acute suffering from molimina. Marvel, of New Jersey, has recently reported such a case in which he had previously made a vagina and an opening into the uterus and resected the ovaries without relief. If accumulation be present it should be liberated through the obstruction and the denuded

FIG. 30

Vaginal septum dividing hymeneal opening.

FIG. 31

Appearance of introitus to double vagina.

surfaces treated secundum artem. Septa should be entirely excised or at least split. If absence of the vagina associated with hæmatometra or pyometra be met with in a woman having marked uterine anomalies, the decision as to whether abdominal ablation will not be preferable to the creation of a new vagina will be difficult. Excepting the danger of peritonitis in removing a uterine pus sac through the abdominal cavity, the abdominal operation will be preferable as a rule. The various surgical procedures employed in the treatment of vaginal anomalies are considered under diseases of the vagina.

THE VULVA.

In some non-viable fetuses absence of the vulva has been noted. The unbroken skin was completely covering this part of the pelvis. With this condition other developmental anomalies are usually present. In it the urogenital sinus, cloaca, and anus are absent. The rectum and Müllerian ducts may be joined to the allantois. In such condition either the rectum and bladder, as well as the vagina, have no outlet unless it be through the allantois, the upper part of which, forming the urachus, has its exit at the umbilicus.

FIG. 32

Vaginal outlet divided by a longitudinal band.

Arrested Development of the Urogenital Sinus.—A condition less extreme than absence of the vulva is a partial development. The urogenital sinus may fail of complete development, resulting in hypospadias or absence of the urethra. In this case the vestibule is absent and the bladder and vagina have a common exit. Formation of the perineum may have failed, the rectum opening into the cloaca just outside the hymen, which indicates the extreme outer end of the ducts of Müller. Rarely the normal anus is found in addition to the anomalous one. In one case I saw, in a girl of three years, complete absence of the external organs of generation and a normal anus existed. The urine was passed by the rectum, and my little finger introduced into the rectum readily

passed forward along a canal toward the pubes. I learned this child died a few years later from an obscure disease. Possibly infection passed up the urinary tract. When the internal genitals are defective in development the two sets of labia may be flattened and small, the mons Veneris flat and not well provided with hair. The vestibule may be narrow and shallow or prominent. On the contrary, the external

FIG 33

Anus vestibularis.

FIG. 34

Hypertrophy of the labia minora.

genitals may appear to be perfect in some cases of absence of the vagina and uterus. This is readily understood when it is remembered they are developed independently of the Müllerian ducts.

Hyperplasia and Hypertrophy of the Vulva.—The labia majora rarely become markedly hypertrophied, though in the colored race notable cases are occasionally observed. Some writers state they have never seen this condition. Hypertrophy of the labia minora is at times

FIG. 35

Normal vulva with congenital absence of vagina and uterus.

FIG. 36

Hypertrophy of the clitoris.

FIG. 37

Hymen with regular opening.

FIG. 38

Hymen with irregular opening.

extreme. It is found normally in the Hottentots and is called the "Hottentot apron." They occasionally reach a moderate degree of hypertrophy in Caucasian women, which has been attributed, though perhaps incorrectly, to abnormal sexual desire frequently gratified or to masturbation. Should irritation and ulceration arise from friction or interference with coition, amputation may be necessary.

FIG. 39

Clitoris greatly hypertrophied.

FIG. 40

Hymen with irregular orifice.

Hypertrophy of the Clitoris.—In prostitutes and some savage races this condition is found. Sexual perversion and excessive coitus probably have direct causal relation, though this statement is by no means a fact, but rather a logical deduction. It may attain the size of a well-developed penis. It usually causes no trouble, but should it prevent coitus or become irritated, or the seat of inflammation, as is frequent from friction against clothing, amputation or resection may become imperative.

Anomalies of the Vestibule. — Anomalies of this structure independent of those of other parts of the vulva are of little moment. Frequently, however, its development is imperfect, being very shallow or narrow or short.

Anomalies of the Hymen.—This structure, developed from the wall of the urogenital sinus and the perineum, may be absent. It may be imperforate, though usually having a single opening that in the adult admits a finger. It may have a crescentic upper border or two or more openings. When several perforations exist it has been given the name

FIG. 41

Hymen with single small central perforation.

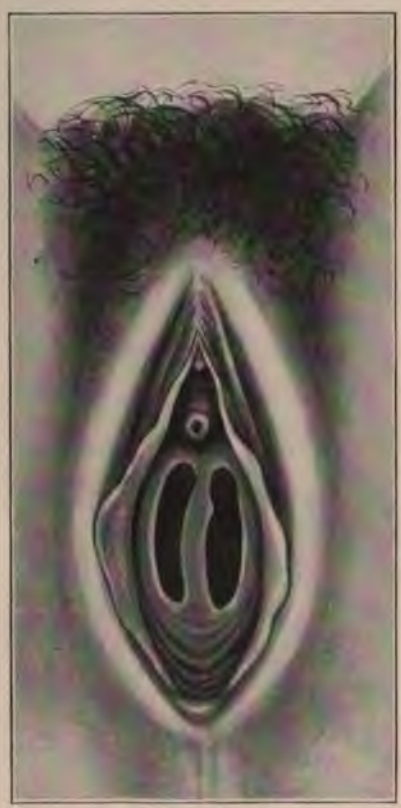
FIG. 42

Hymen with two minute openings.

"cribriform" hymen. It may be hypertrophied and form a barrier to vaginal coitus. Occasionally it has persisted until parturition, when it had to be incised. In this form severe hemorrhage usually attends its rupture in coitus and fatal hemorrhage as a result has occurred. In severe cases the rupture has been found to extend into the rectum and the vaginal wall. It may be so elastic as to yield in coitus and even labor without rupture. Hirst recorded a case of unruptured hymen

in a prostitute. After puberty the imperforate hymen may cause hæmatocolpos or hæmatometra. In this condition it is found as a purplish or

FIG. 43



Hymen with double orifice.

FIG. 44

Sculptured hymen.

nearly black protruding membrane, and is to be incised. A small central perforation or a conical incision is sufficient.

HERMAPHRODITISM.

The word hermaphrodite is derived from two Greek words—Hermis and Aphrodite.

In Quain's *Dictionary* the definition of hermaphrodite is "a term applied to an individual in whom the formation of the sexual organs is such as to give rise to the impression that both the male and female organs are present." Ahlfeld offers the definition, "An individual with

functionally active glands of both sexes, provided with excretory ducts." The older writers insisted that true hermaphroditism occurred in the human as well as in the goat, pig and certain fishes, but no autopsy with microscopic examination of the suspected organs has ever proven this condition to exist in man; and unless the case reported by Sarré, which had a well-developed imperforate penis and from whose groin was removed a testicle, epididymis and some ovarian tissue, is an exception, one is justified in declaring it an impossible condition.

FIG. 45

Cribriform hymen.

True Hermaphroditism.—There may be a condition approximating the one referred to above, and several instances have been recorded in which sexual glands that histologically resemble both ovary and testicle existed. Strictly speaking, this might be termed *false hermaphroditism.* However, for convenience of description such cases are accepted as being of the true variety, while the term false hermaphroditism will be applied to cases farther removed from the ideal type.

This class contains the vastly larger number of recorded cases of hermaphroditism, and they are usually males having hypospadias with

a perineoscrotal fissure. They have the glands of one sex and other sexual parts mixed or intermediate. They are at birth usually considered as females and dressed and educated as such. The hair on the head grows long, but the beard rarely becomes noticeable. The breasts are large, sometimes containing secretions. The waist is small and the hips are broad. Hirst mentions one case in which trousers were first worn at the age of nineteen. He had been reared as a girl until his beard began to grow and he began to manifest sexual inclinations toward female companions. Usually they have married and have

FIG. 46

Imperforate hymen.

FIG. 47

Imperforate hymen with hæmatocolpos.

copulated with their husbands through the accommodating urethra, and have even thought they menstruated. This latter condition has been attributed to coital injuries of the urethra, and in one notable case, that of Katharina Hohman, epistaxis furnished the individual with blood to smear the external genitals. In this manner Rokitansky was deceived and pronounced Katharina a true hermaphrodite. In a few instances these subjects have consorted with women, apparently with satisfaction to both. In Rokitansky's case just cited the condition was clearly perineoscrotal hypospadias, with the right labium containing

a testicle and the mammary glands apparently of the female type. In some cases the sex was not questioned until physicians were consulted for relief of sterility. Upon inspection the conformation of the external genitals appears to be that of the embryo exaggerated. The penis may be free, or it may be attached along its lower border by a frænum. The glans is perhaps as large as at puberty and is entirely devoid of a urethra. A frænum usually extends from it to the external urinary meatus,

FIG. 48

Bilateral hermaphroditism: *a*, glans penis; *b*, anterior arm of corpus cavernosus; *c*, corpus cavernosus of urogenital canal; *d*, corpus cavernosus penis; *e*, bulb; *f*, membranous portion of urogenital canal; *g*, prostate; *h*, vagina; *i*, bladder; *k*, uterus; *l*, ureter; *m*, round ligament; *n*, bloodvessels; *o*, testicle; *p*, ovary; *q*, hydatid of Morgagni; *r*, fimbriated extremity of Fallopian tube; *s*, parovarium; *t*, Fallopian tube; *u*, ligament of ovary; *v*, fundus uteri; *w*, broad ligament.

perhaps an inch below the root of the penis. There may be developed in the masculine hermaphrodites a vulvar orifice, a hymen, a vagina, a uterus masculinus, and Fallopian tubes. Pozzi has seen in two cases a perfectly formed hymen at the vaginal opening, and says it is usually maintained intact, due to the hyperæsthesia of the parts. The vagina may be of normal length. Franque reports a case in which are the external organs of the male and above them a vagina opening into the

prostatic portion of the urethra, as well as a uterus and oviducts, both well developed. Zweifel reports the autopsy of a child of six months

FIG. 49

A. Feminine pseudohermaphroditism.

showing hypospadias, with testicles and Müllerian ducts completely developed into uterus, tubes, and vagina. A very common disposition

of the organs is a rudimentary hypospadiac penis with the urethra opening by a separate canal at the urogenital cleft, a rudimentary development of the lateral wings of the scrotum and testicles in the abdominal cavity. The vasa deferentia is found emptying into the urethra or urogenital cleft or, more rarely, into the vesicula prostatica. An intermediate type is that in which the external genitals are nearly normal in appearance and the uterus masculinus and vagina open into the urethral canal of a fairly well-formed penis. The scrotum shows various grades of development. One-half may be well developed and contain a testicle, while the other is rudimentary and empty, its testicle being in the inguinal canal or the abdomen.

FIG. 50

B. Feminine pseudohermaphroditism. Same case as *A*.

This class of so-called true hermaphroditism is composed of those conditions in which certain parts of the several organs of both sexes are present, with evident predominance of one. It may be subdivided into gynandry and androgyny, according as the individual is actually male or female. In the first of these the external female genitals resemble those of the male if the clitoris be hypertrophied and the labia majora and, perhaps, minora are fused. The vulvar opening is thus hidden and an appearance resembling that of the scrotum is furnished. Should the labia majora be distended from an ovarian hernia, an enlarged Bartholinian gland, or from any other cause the resemblance is the more striking. The hypertrophy of the clitoris is general, and,

therefore, its resemblance to the hypospadiac penis is very misleading. It may acquire a length of two or three inches. Very frequently these formative vices are accompanied by abnormalities of development of the internal genitals.

FIG. 51

Feminine pseudohermaphroditism; the right labium contained an ovary.

In the second division, androgyny are usually monorchid or cryptorchid males who present certain external characters of the female, especially largely developed breasts. The type is masculine, the penis is perforate, and the scrotum fused and empty. The central depression, resembling the space between the labia majora, together with absence of the testicles and combined with the large breasts, all conspire to

FIG. 52

Incomplete pseudohermaphroditism; hypertrophied clitoris.

FIG. 53

Masculine pseudohermaphroditism.

FIG. 54

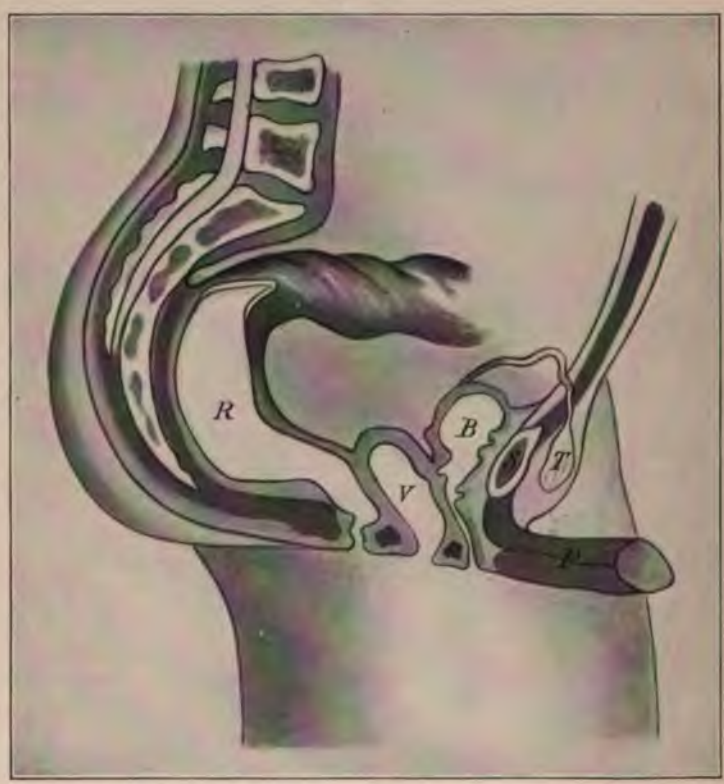
Carl Lohmann, who lived forty-six years as a female, then married as a man.

convey the impression of the female sex. The mammary development is especially noticeable in this class of cases.

A reliable rule to follow is to consider each case of hermaphroditism as of the male type until it is proven to be otherwise. It is advisable to examine for spermatozoa in the discharge incident to sexual excitement. Of course, in the female no better proof than pregnancy could be desired.

Great care is necessary in examining these conditions, and even this combined with consummate skill will fail in a large proportion of cases

FIG. 55



Masculine pseudohermaphroditism: *P*, penis; *T*, undescended testicle; *S*, symphysis pubis; *B*, bladder · *V*, vaginal cul-de-sac; *R*, rectum.

to fully determine their exact character. The rectal touch, the probe, and rarely the uterine sound with abdominal palpation and general anæsthesia may clear up many of them.

Treatment.—Often little can be done to relieve the condition. Fused labia may be separated, hypospadias relieved by appropriate plastic operation and a bridled penis liberated, but, as a rule, the conditions are calculated to baffle the most enthusiastic surgeon.

Great care is necessary to determine the sex in cryptorchids, and no surgical operation for the relief of such deformity should be performed until the sex of the individual is positively determined. For such conclusion it is necessary to wait until the age of about thirty years has been reached for some sign that may be considered positive of sex, such as the ejaculation of spermatic fluid, the descent into the scrotal sac of a testicle, permitting palpation of the epididymis, cord, and testicle, or positively a menstrual flow. This latter is unreliable, as it

FIG. 56

Masculine pseudohermaphroditism.

FIG. 57

Pseudohermaphroditism (masculine); perineoscrotal hypospadias.

is quite susceptible of simulation, as was the Katharina Hohman case, in which sufficient blood from an epistaxis was secured to smear the genitals and cause Rokitansky to wrongly decide the condition. This method of diagnosis failing an exploratory laparotomy is indicated for the determination of sex, as demonstrated by the existence of either ovaries or testicles. Having established positively the sex of the individual the performance of such surgical operations as are required to remove the impediments to the use of the sexual functions or organs

FIG. 58

Masculine pseudohermaphroditism.

FIG. 59

Male hermaphroditism: *A*, frænum; *B*, meatus urinarius; *C*, vaginal orifice.

is the proper procedure. Neugebauer has published in the *Zeitschrift für Gynäkologie*, January 16, 1904, some exceedingly interesting cases bearing on this subject, and demonstrates the impossibility of determining the sex in some cases without an exploratory laparotomy as well, proving the fallacy of accepting the judgment of the individual in question on this point.

Four of the 6 cases he there reported were reared as females; 3 of the 4 were proven to be *erreur de sexe*, 1 by an abdominal incision, 1 by an incision into the vaginal canal, and 1 by the descent of a testicle in the eighteenth year; 1 was proven by an abdominal incision to be not an *erreur de sexe*. Neugebauer very properly criticises Landau for operating to remove an hypertrophied clitoris[1] from a widow, aged twenty-eight years, in whom the sex was undecided both by Landau and the patient, claiming Landau followed the old Prussian law of allowing the adult person to choose the sex rather than the scientific code, which recognizes only males and females.

[1] Berl. klin. Wochenschrift, 1903, Bd. xli. p. 99.

CHAPTER III.

MENSTRUATION.

By J. RIDDLE GOFFE, M.D.

Definition.—Menstruation is a regular periodic experience through which every woman passes about every twenty-eight days. It is characterized by a bloody discharge from the vagina, and in the majority of women is attended by a feeling of languor and general discomfort. The amount of discharge and its duration as well as the amount of discomfort are all varying factors, not only in different women from month to month, but in the same woman. The amount of discharge varies from two to ten ounces; the duration is from three to seven days; and the discomfort ranges from a simple congested feeling in the pelvis to severe dragging pain. The discomfort may be the first premonition of the menstrual approach. Some women who are blessed with unusual physical vigor and general health do not have any evidence of menstruation except the bloody discharge. Such experiences are very exceptional. The menstrual life of women first appears usually about the fourteenth year and continues to about the forty-fifth year. The time of the first appearance and the close of menstruation are influenced by climate, race, and environment. It begins earlier in warm climates than in temperate or frigid zones. Girls who lead indolent, luxurious lives menstruate earlier than their humbler sisters. As a rule, those who menstruate early in life reach the menopause early. All of these rules are subject to individual variations, which may be within the limit of health. Some women have a normal interval of two weeks, others have five or six. But any constant departure from the customary interval must be regarded as abnormal for that individual.

Menstruation in rare cases has been observed at a very early age. It has been known to begin in infancy and continue regularly. It is usually attended in such cases with premature development of the breasts and the generative organs. Investigations differ regarding the coincidence of ovulation and menstruation and their relation to each other. Clinicians who have given attention to this feature, in patients under continuous treatment, are of the opinion that ovulation occurs alternately in the two ovaries. Certain it is that congestion and sensitiveness occur in the ovaries alternately just preceding menstruation, and disappear promptly thereafter, indicating a positive relation of time and cause in ovulation and menstruation. The beginning and the close of the menstrual epoch mark the limits of the childbearing period.

The menstrual discharge is composed of blood, mucus, and epithelial cells. It is dark, thick, and viscid. The sources of these constituents are

PLATE II.

Fig. 1.

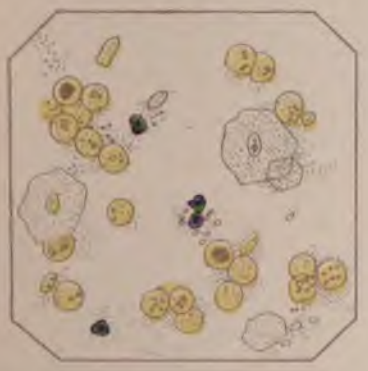


Fig. 2.

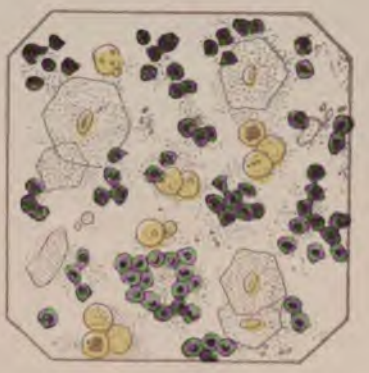


Fig. 3.

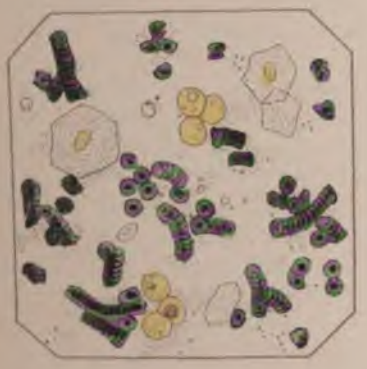


Fig. 4.

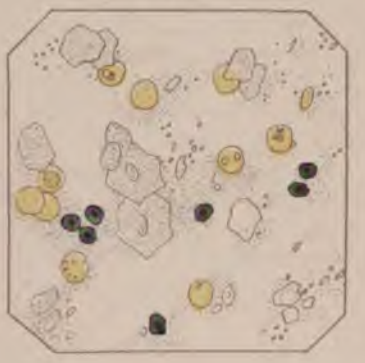


Fig. 5.

Fig. 6.

Fig. 7.

Corpuscular and Epithelial Elements and Debris Contained in Menstrual Fluid.[1]

Figures 1, 2, 3, 4. Microscopic view of fluid at different periods of menstruation.
Figures 5, 6, 7. Fragments of endometrium cast off ten days after menstruation.

[1] After Pouchet.

the interior of the Fallopian tubes and the uterus. Much of the mucus is contributed by the glands of the cervix uteri, the vagina, and the vulva.

The beginning of menstrual life is a more or less critical period for the young girl—this marks her entrance into womanhood, or the child-bearing period. Previous to this she has developed along lines parallel to those of the boy. The effort of nature has been to evolve the frame-work, the muscles, and those organs that tend to the maintenance of the individual. The generative organs have lain dormant. They are unnecessary to the life of the individual, and nature has left them for development until the last. But now, as if at a bound, a new life seems to open to the vision of the girl. She is conscious of a something in her existence that was not present before. The familiarity with her boy playmates becomes restrained, and a sense of modesty and of self-consciousness takes possession of her. Her breasts enlarge, hair begins to appear on the pubes, and a general fulness and rotundity is apparent in all parts of the body. These are the outward signs of the fact that the ovaries, the uterus, the Fallopian tubes, and the entire generative system have begun to develop and mature.

It seems to be a strange law of nature that the two or three years from thirteen to fifteen have been set aside for the development of the generative organs. That is the designated time for the establishment of menstruation and the power of reproduction. If it is not accomplished at this time the infantile organs of generation persist, the normal blood supply is not established, menstruation is not properly performed, and the unfortunate ills and affections peculiar to women begin. This continues until some extraneous impulse is given to these organs to awaken them to new life. This may be the marital relations or it may be local treatment at the hands of the gynecologist, or both. Many women give a history of having suffered from dysmenorrhœa from the time of puberty, but were relieved after a few months, or a year, of married life.

The question arises what must (should) be the life of the growing girl to establish for her a firm basis of health prior to puberty and what the regimen during the establishment of her menstrual life? From infancy to puberty physically the girl and the boy are on about an equal footing. The mode of life of the average boy evolves a man physically equal to the demands of after-life. Why is it not, therefore, in a general way a proper standard for the girl? She should play the boys' games with the boys; with them learn to row and sail a boat and paddle a canoe; with them learn to ride a horse, sitting astride, as is now being quite generally taught, and familiarize herself with all the means to ends in general affairs that a boy acquires in his effort to do things on his own initiative. Above all, let her learn to walk, to run, to jump, to climb, and acquire that elasticity of gait that gives ease and grace of motion. No grace of motion is possible without strength, and the two are more or less reciprocal. To carry out this *régime* the dress of the young girl must be simple and of such a character as to enable her to compete with the boy in physical feats

without restraint of clothing. Dress her simply, and for her play-hours let the material be coarse and strong, without danger of being torn easily or fear of being spoiled by a little dirt. At no time should the dress be so tight at any point as to restrain the free play of all the muscles, those of the diaphragm and abdominal wall as well as those of the arms and legs. Regular meals, such as are adapted to the powers of digestion, and regular hours for sleep are most essential.

A girl raised in this way will come up to the pubertial period with a surplus of vitality that is requisite to the proper evolution of the generative organs, while her normal life runs on smoothly and uninterruptedly. The idea of such an experience is well illustrated by the history given by a patient who applied for relief from the lesions of childbirth. The first intimation of her menstrual life came to her one day while with her playmates of both sexes she was paddling and wading in a stream of water. Without any unusual sensation or feeling of depression she noticed in the water a stain of blood that seemed to come from her. This alarmed her somewhat, and led her to immediately gather up her shoes and stockings and go home to her mother, who then and there explained to her its significance.

THE SIGNIFICANCE OF MENSTRUATION.

It was formerly believed that menstruation was a function peculiar to women. Later it was discovered that monkeys in captivity also menstruate. The rut of animals, as the dog, the horse, the cow, and the deer, is a function closely allied to menstruation. It has been suggested that they all menstruate, but that the discharge being retained in the uterus by reason of the position of that organ is reabsorbed, while in women and monkeys it appears externally because of their upright posture. Many theories have been advanced to explain the *raison d'être* of this function and its physiological importance. Without going into the discussion of the pros and cons of many of them the most rational explanation consists in the theory that menstruation is the result of a frustrated attempt on the part of nature to reproduce an individual of that species. An ovum is thrown out from the ovary and gradually finds its way toward the uterus. Nature begins at once preparation for its reception. The nervous system becomes exalted to a high degree of functional activity. The blood supply to these parts is increased. The endometrium, which is the soil in which the ovum is to be implanted, becomes turgid, soft, and velvety. Its epithelial cells swell and multiply, and every preparation is made to nourish the welcome guest and give it a home.

If, perchance, this guest has been annointed with the baptism of spermatic fluid she is ready to respond to this bountiful preparation and partake of the good things that have been provided. Nature economizes her resources, nothing is lost, and everything accomplishes its end whereto it has been sent. But if the sacrament of baptism has

PLATE III.

FIG. 1.

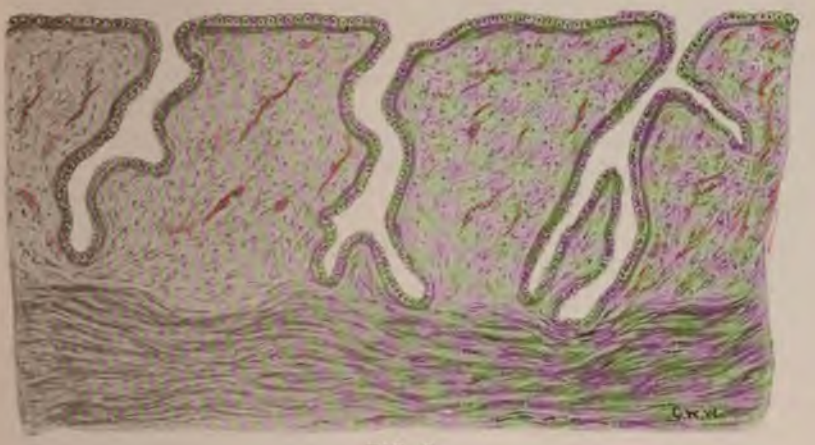


FIG. 2

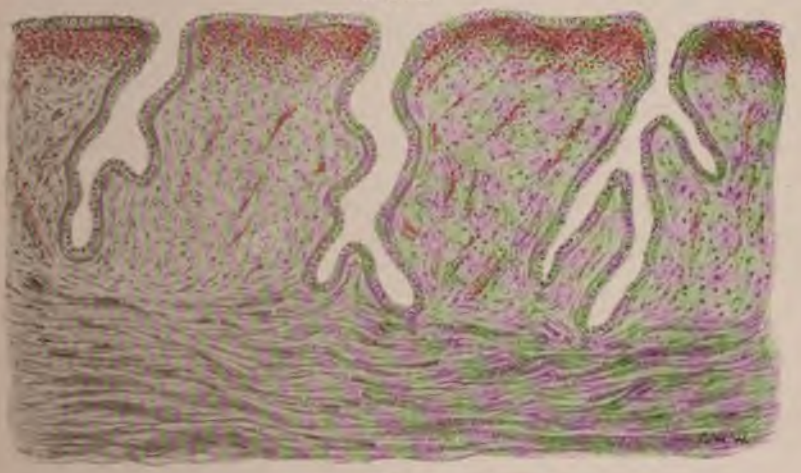
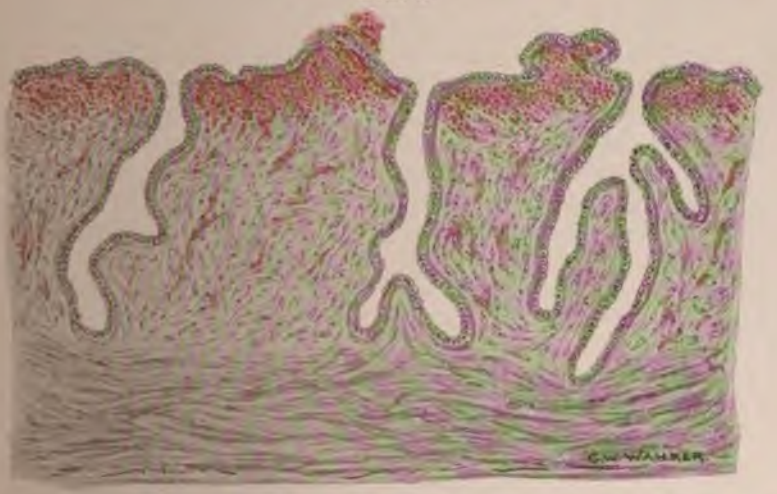


FIG. 3.



Anatomy of Menstruation (Modified from Gebhard). (Dudley.)

FIGURE 1.—Stage of premenstrual congestion.
FIGURE 2.—Stage of subepithelial hæmatoma.
FIGURE 3.—Stage of bursting of blood through the surface epithelium. 90 diameters.

been omitted the guest is incompetent to receive the hospitality extended, and is therefore cast out. The preparations are also eliminated: the exuberant epithelial cells are exfoliated, the delicate capillaries already constructed to nourish them are ruptured, the congested and engorged glands discharge their contents, and all come away in the form of menstrual blood or discharge.

THE HYGIENE OF MENSTRUATION.

The old Jewish law that forbade women to bathe during menstruation has not only established a custom among that nationality throughout the world, but has invoked the practice among all women of abstaining from the bath during that time. Nothing could be more erroneous. If there ever is a time during a woman's life when she needs a bath it is when she is menstruating. Not only is there coming from her a highly organized vaginal discharge that readily undergoes decomposition and emits a disagreeable odor, but the skin and especially the sudoriferous glands in the axilla and groin are eliminating an unusual amount of effete material. Unless removed by plenty of soap and hot water this accumulation stagnates the ducts and glands and emits a disagreeable odor that makes the woman offensive to herself, and anything but an agreeable companion to her associates. Women recognize this fact, and to overcome it load themselves with perfumery. This is as false to true hygiene as sprinkling a house with deodorizers or perfumes when the condition demands the strongest disinfectants or germicides. The bath is the thing. And the same regimen of bathing may be continued as during the rest of the month, except that it should be emphasized both in frequency and thoroughness. A hot tub bath is as beneficial now as at any time, and as far from danger. This same general rule applies to the entire regimen of life during this period. A woman that is leading a normal healthy existence need not change her habits at the time of the monthly flow. A reasonable amount of out-door exercise is important. Congestion of the pelvic organs if allowed to continue produces discomfort and pain. Relief is secured by equalizing the circulation throughout the system, diverting the blood to other parts by exercise. The amount and character of exercise will vary with the customary habits in this particular. It should be sufficiently violent and prolonged to keep the blood freely circulating and the extremities warm. If the feet and hands are cold, relief is best secured by exercise or a hot tub bath.

The nervous system is the most important factor to be considered in this connection. Anything that tends to undue nervous strain should be studiously avoided. School-girls must be made to understand, and school-teachers more particularly, that high pressure must be relaxed. The brain must concede something of its fuel and flame to the functions of the generative organs. Social obligations, so exacting in these strenuous times, must recognize that woman owes something to herself individually as the keeper of her own health and the present or the

future mother of the race. Undue fatigue at social functions, especially in positions of responsibility, exhaustion and rash exposure while overheated at a ball, are fruitful in interrupting, modifying, and disorganizing the menstrual function.

SCANTY MENSTRUATION.

Scanty menstruation may attend a single period, may be a continuing habit within the limits of health, or may be a premonition of permanent cessation even in an early period of life. Obesity is a frequent cause. The condition may or may not demand treatment. The indications are similar to those considered under amenorrhœa.

VICARIOUS MENSTRUATION.

Vicarious menstruation is a discharge of blood or other markedly increased secretion at the menstrual period from some part of the body other than the vagina. The menstrual discharge from the vagina may be wholly or only partially suppressed. The vicarious bleeding may emanate from any of the mucous or cutaneous surfaces. The most common source of the discharge is from the nose or the skin in the axillæ. It may come from the throat, the lungs, the stomach, the arms, the bladder, or the groins. Sometimes it takes the form of ecchymosis in various parts of the body. Varicose ulcers of the leg have been seen to weep, and a monthly flow of milk from the breasts has been observed.

Vicarious menstruation is not a common occurrence. It may be observed in cases of defective development of the generative organs and in debilitated, nervous women. I have observed it in a buxom young woman of great vitality and intense sexual passion. The location of the discharge was alternately the axilla and the nose, occasionally both. She observed it, she said, whenever her sexual desires were not gratified for an undue period.

Treatment.—Attention should be directed to the discovery of some cause for the insufficient performance of the function by the uterus and its remedy. Any local lesion of the uterus should be relieved and stimulating treatment applied. The seat of local bleeding rarely requires attention unless the discharge is excessive. Sometimes an astringent application is of benefit.

AMENORRHŒA.

Amenorrhœa is absence of menstruation. It is classified as primary and secondary. Primary amenorrhœa (*emansio mensium*) is applied to those cases in which the menstrual discharge has never appeared. It may be due to lack of development (delayed menstruation) or to a malformation causing atresia and preventing the escape of the discharge.

In the latter case menstruation may have occurred but the discharge has not appeared, being retained in the uterus or vagina.

Secondary amenorrhœa (*suppressio mensium*) is applied to those cases in which menstruation has ceased after having been established. The most common cause of this is pregnancy, and this should suggest itself in every case. It should not dominate the mind of the physician, however, to such an extent as to protrude itself unduly in cases of unmarried women. But it is to be borne in mind even in investigating these cases, and care taken not to interrupt a beginning pregnancy. It is often caused by overwork, mental and physical. Studious school-girls and anxious, overworked mothers of large families suffer from amenorrhœa.

Any chronic debilitating condition, as chlorosis, anæmia, malaria, or tuberculosis, may be attended with amenorrhœa. It is especially common in phthisis, and is erroneously thought by the uninformed to be the cause of consumption. Patients suffering from phthisis are frequently brought by anxious mothers to the physician for the purpose of having the menses brought on, ignorantly thinking the absence of menstruation to be the cause of the decline. Change of climate and environment sometimes causes amenorrhœa. Immigrants, especially Irish girls, are subject to it. And some who move their residence from the country to a large city are similarly affected. In these instances time usually brings about relief, especially if assisted by increased out-of-door life. Excessive general development of fat, if occurring suddenly, even in young girls, will cause the disappearance of menstruation. Excessive accumulation of adipose tissue seems to exert a similarly baneful effect on fertility. Cases have occurred in the practice of the author in which sterility has attended the accumulation of fat in women formerly prolific, and after years of sterility pregnancy occurs promptly upon reduction to near normal weight. In acute diseases, especially typhoid fever, menstruation ceases, to return only with restoration of health and strength.

Fright, grief, or anxiety may cause retardation or complete suppression of an expected menstruation. Fear of pregnancy following an unusually pleasurable intercourse in a woman who does not desire children may cause amenorrhœa. This is not uncommon after illicit coitus. Finally, it must not be forgotten that amenorrhœa is frequently associated with insanity and that occasionally it occurs in both old and young without any discoverable cause, the patient being in good general health.

Treatment.—In the treatment of amenorrhœa the etiology of the condition must be kept prominently in mind. In young girls suffering from lack of development no local treatment is to be considered except as a last resort. General treatment must be directed toward the suppression of the mental, nervous, and emotional side of life and the moulding up of the purely physical. School work should be relaxed, the hours spent at the piano curtailed or entirely eliminated, and an active life in the fresh air insisted upon. Calisthenic exercises of a light and simple character undertaken for only a few minutes each day are of great assistance in building up the physique of girls. Bathing,

swimming, boating, riding or driving, and out-of-door games of all kinds that give a zest and interest are of incalculable value. A change of scene and environment is sometimes necessary. It is of little use to prescribe all these at once or in a general way. The influence of the physician in this particular must be educational, both toward the patient and the parents. Find out the tastes and inclinations of the girl and in what direction she can best be started, and lead her on along the lines of least resistance, keeping the end constantly in view. This regulation of the daily life must be supplemented by such medicinal adjuvants as may be indicated. If the exercise is not sufficient to improve the digestion and regulate the bowels, appropriate laxatives and digestives must be prescribed. Powerful cathartics, or light cathartics continued for weeks or months, do harm. If the digestion is right the bowels will be right, and the digestion is best adjusted by a proper balance between the character of the diet, and the amount of food and exercise.

Iron, strychnine, cod-liver oil, and the hypophosphites are excellent tonics and are frequently indicated. The so-called emmenagogues are unreliable; they are more apt to do harm by upsetting the stomach than accomplish any benefit. In a few instances potassium permanganate, dioxide of manganese, viburnum, and hydrastis have each seemed to afford relief. They are worthy of trial. If the trouble can be attributed to malaria, quinine or arsenic is indicated.

In extreme cases of defective development of the uterus and ovaries, that do not respond to dietetic hygienic and medicinal treatment, the pelvic organs should be examined per rectum or an anæsthetic should be administered, a vaginal examination made, and treatment applied. A small, sharply anteflexed uterus will usually be found. A thorough dilatation slowly and carefully performed with a steel dilator and the uterus gently curetted and packed with gauze will give benefit and start the internal generative organs on a career of development. The gauze should be left in place three or four days. The glycerin tampon treatment may be continued if deemed necessary or advisable.

If the amenorrhœa is accompanied by periodic symptoms of menstruation, nausea and vomiting, local pain and general discomfort, and does not respond to the hygienic treatment, careful examination may reveal atresia of the vagina or os uteri and enlargement of the uterus from retention of the menstrual discharge. For this condition proper surgical procedures alone can give relief. Entire absence of the uterus or ovaries may be found.

Acute suppression of the menses may be caused by what is ordinarily known as taking cold. It may be due to getting the feet wet or to lowering the temperature of the body through insufficient protection against rain or cold. Some sudden and extreme emotion either of grief, joy, or pain may suppress the flow. Ovarian and general pelvic pain may accompany this or there may be no subjective symptoms. The treatment consists of rest in bed, hot applications to the lower abdomen, hot foot baths, and in cases of extreme shock and pain a hypodermic

injection of morphine. In the majority of cases the most prompt and efficient treatment is a hot tub bath of twenty to thirty minutes' duration, followed by rest in bed. This equalizes the circulation, thus relieving congestion, and calms the nervous system. In cases of idiosyncrasy in which hot baths are exciting, of course it would not be indicated.

DYSMENORRHŒA.

Dysmenorrhœa is a term applied to painful menstruation. It is a symptom, not a disease. As a rule, all women at some time during menstrual life suffer more or less at the monthly period. This may be present during the first few months or years of puberty, disappearing upon the thorough establishment of the menses or may extend throughout the entire menstrual epoch, being relieved only by the appearance of the menopause either normally or artificially induced. It is the *bête noir* of womanhood. The trials of gestation and parturition are borne with comparative equanimity. They are definite in character and duration. Moreover, there is a purpose to be attained and reward at the end. But the purposeless practically needless pain, excruciating headache, and general discomfort which some women are condemned to bear at each recurring period drive them into retirement, disorganize the family household, break down the patients' nervous systems, and make physical wrecks. The fortitude shown by woman in the endurance of this trying experience and the dumb philosophic spirit with which she resigns herself to its monthly recurrence are attributes of woman peculiar to the sex. Tradition and custom and Biblical teaching have implanted the idea that it is inevitable. But modern hygienic science is demonstrating the falsity of this position. According to the more or less permanent factor in the case dysmenorrhœa is classified as uterine or ovarian. No sharp distinction can be drawn between them. In many instances the pain has its origin in the uterus and with equal frequency it arises from the ovary, but the nerves of both are in such intimate sympathy that they quickly become reciprocally involved, the spinal centres participate in the disturbance, the digestive system becomes affected, nausea and vomiting may occur and a splitting headache supervene. If the pain precedes the flow it is usually regarded as ovarian; if it appears in connection with the flow and continues through the period it is considered as uterine. If it both precedes and accompanies the flow some pathological condition may be present in both organs, or it may be entirely functional and due to the debilitated condition of the general health.

Etiology.—The etiology of the symptom is congestion—a functional congestion connected with menstruation in which the process for lack of vital force is not completed or a pathological congestion due to an existing organic disease.

Pathology.—The pathology of dysmenorrhœa is to be found in: 1. Lack of development. 2. Defective development. 3. Small con-

tracted (sclerotic) or large cystic ovaries. 4. Displacements of the uterus with or without prolapse of its appendages. 5. Fungous or polypoid endometritis. 6. Salpingitis. 7. Fibroid or fibromyomatous tumors of the uterus.

Lack of development is manifested by a small anteflexed uterus, diminutive ovaries, and constricted uterine canal. Defective development may take the form of a double or bicornate uterus, with occlusion of one horn. Menstruation proceeds normally in one horn while the menstrual blood is retained in the other. Accumulating here from month to month, it causes distention and pain. A tumor is thus formed, which in the course of years may assume considerable proportions.

Dr. T. Gaillard Thomas has reported a case which occurred at the Woman's Hospital during the interneship of the writer. A married woman, the mother of several children, who had suffered from dysmenorrhœa all her life presented herself for relief. On examination the uterus was crowded to the left side of the pelvis by a tumor which was internally associated with the uterus on the right side and was diagnosed as an intraligamentary ovarian cyst. Upon opening the abdomen and puncturing the tumor with a trocar a bloody discharge appeared of coffee-ground character. The trocar puncture was enlarged and the sac evacuated, whereupon it was discovered that the tumor was the right horn of a double uterus. The sac was stitched to the abdominal incision and drained. At each succeeding molimen the woman menstruated both per vaginam and per abdominal incision. Eventually a silver tube was inserted in the right horn of the uterus through the fistulous tract in the abdominal scar and constantly worn. Through this the patient menstruated regularly as well as per vaginam.

Large cystic ovaries are not so frequently the source of pain as the small contracted ovary. The danger of the former is that they may develop into large ovarian tumors, but we know that ovarian tumors rarely give symptoms, except those of pressure due to their size. The small contracted ovary, however, due to premature atrophy is a frequent cause of pain. Retrodisplacements of the uterus are a fruitful cause of dysmenorrhœa. The displacement causes a twist in the broad ligaments which in turn interferes with the blood supply and keeps up a constant congestion. This is greatly aggravated at the menstrual period, hence the pain. Fungoid or polypoid endometritis causes pain from uterine contractions or from the polypus being forced down into the cervical canal and causing obstruction. A fibroid polypus springing from the cervix is most apt to produce this condition. The polypus may be forced down by uterine contractions till it projects through the external os, and being firmly held there by its pedicle acts like a ball valve in obstructing the escape of the menstrual discharge and thus causing uterine contraction pains. Membranous dysmenorrhœa is the shedding of the entire mucous membrane of the uterus in the form of a cast of the interior of the uterus. Such cases are rare and the cause is unknown.

Treatment.—The treatment to be applied in any individual case depends upon the diagnosis. The most common and persistent cause is lack of development. This is found in young girls, in young married women, and in old maids. It seems to be a pretty constant law of nature that unless the uterus and generative organs are developed at the time set aside for that purpose they persist in their undeveloped form, and the individual goes on through life in an attempt at menstruation with organs unequal to their task. When the girl approaches the childbearing age nature prepares for it by directing the vital forces to that end. To accomplish her object requires all the animal energy of which the individual is possessed. Now is the time for relaxation from nervous and mental strain, and the participation in as free out-of-door life as can be attained. Instead of this, however, we find her bending over her books in an overcrowded school-room, or, as one writer has said, "a jail-like boarding school, adding fuel to the fire of antagonism between brain and indigestible foods, leaving the imprint of the unequal struggle on the reproductive organs. With too poorly established sexual functions and perfect disregard of menstrual work the undeveloped woman leaves school to plunge into the vortex of social dissipation, followed by an assumption of wifely duties and responsibilities toward the husband who has seen only her bewitching face and not her frail body" (Hale). It is clear then that prophylaxis is the proper treatment. The family physician must keep his eye on the growing girl and counsel the parents in all that relates to the preparation for and the *régime* during the period of puberty. And the question arises, To what extent should the girl be instructed regarding the function of menstruation, and in what form may it best be presented? Undoubtedly the mother is the one to undertake this confidential task. Lawson Tait somewhere drops the suggestion that from analogy of the fertilization of the flowers the idea of reproduction may be gained in the purest and the simplest form. In my lectures to nurses I have found this idea most helpful. The universal law of nature is that every living cell, whether in animal or vegetable kingdom, has its origin in some previously existing cell. Virchow enunciated this law in his celebrated formula: *Omnis cellula e cellulo* (every cell from a cell). Throughout the whole range of his investigations man has never been able to invent or discover any other method of reproduction. No combination of inert chemical elements has ever been able to produce life. Spontaneous generation is a myth. While in some of the lower forms of animal and vegetable life reproduction is accomplished by a process of division or separation of a part from the parent which becomes a new individual, in all the higher forms of life the universal law is that a new individual is generated by the union of two cells. These are called the male and the female elements or cells. In flowers and trees this process is accomplished in the blossom. Analyzing the parts of a blossom of a plant or a tree, we find two distinct structures, a pistil, usually in the centre, and around it a row of stamens. Within the pistil is the female element or cell, and on the

stamens is the pollen or male element. In order that any seed may be capable of developing a new flower or a new tree, the male element or the pollen must come in contact with the female element or ovule within the pistil. This is done in various ways, but usually by the pollen being shaken off by the wind upon the end of the pistil, which absorbs it, and by means of its circulatory system carries it into the ovule. Thus the two elements coalesced and a seed is formed capable of producing a new individual flower or tree. In some species of tree and flower the pollen is produced upon one tree or flower, while the pistil with its ovule is found on another tree or flower of the same kind or species. The tree or flower bearing the pollen is called the male tree, and the tree or flower producing the pistil containing the ovule is called the female. Nature has devised most ingenious methods of carrying the pollen to the pistil. Sometimes this is accomplished by the wind, often by bees, butterflies, and other insects as they go from flower to flower, and in some instances by humming birds, whose beaks are elongated and curved to enable them to reach in the curiously shaped flowers from which they obtain the pollen and honey. The same principle holds in the animal kingdom, and nature has devised as many and curious methods of securing the conjunction of the male element or cell with that of the female as in the vegetable kingdom.

In the lower orders of animal life, as in the fish, nature scatters the male element as generously as she does the pollen among trees and flowers, leaving it more or less to chance to find its contact with the female element. The female fish at breeding time follows up some stream or brook till she finds a quiet nook in which her eggs may be deposited unharmed. The male fish following after swims about among the eggs scattering the male element or seminal fluid, which the currents and eddies of the water bring in contact with the eggs. Among the higher animals special organs are devised for bringing the male and female elements together. Among men and women, as with horses and cows and many other animals, reproduction does not begin until they have obtained their growth. The sign that a woman has reached the period when she is capable of bearing a child is the appearance of a bloody discharge from her genitals. This bloody discharge we call menstruation. It recurs in a woman about once every month, and is therefore called the monthly flow or menses. It means that from this time on there is an ovum ready to be fertilized by contact with the male element, from which pregnancy follows.

This is only a suggestive outline of what may be done in the direction of teaching girls the significance of menstruation without unduly fixing their minds on the genital organs. Many illustrations may be drawn from both plants and animals and the subject filled with inexhaustible interest. Once rob a subject of its mystery and it loses its fascination as a field for the play of the imagination—that dreamy imagination which is the thief of time and the snare of virtue.

Now the girl is ready to co-operate in the regimen of life during the menstrual epoch which is set forth in the section on the Hygiene of

Menstruation. During the years of puberty and until menstruation has been painlessly and normally established the girls in their school work should be separated absolutely from the boys. Their curriculum should be less exacting, not in the quality of the work but in the time required for its accomplishment. It would be well, moreover, if girls could be arranged in sections according to the coincidence of their menstrual periods and still greater leniency allowed at that time. This may seem an extreme position to take, but something radical must be done to ensure on the part of the reproductive organs of woman a more normal physiological performance of their functions, not only for the benefit of the individual woman but also of the race.

If a girl has been unfortunate enough not to have had this supervision and care, or if in spite of it she suffers from dysmenorrhœa, the physical, mental, and social habits of the patient must be investigated, with the view of determining the cause of undue congestion of the generative organs. In habitual constipation of the bowels is frequently found one source of the difficulty. Regularity in this particular should be secured and maintained. All mental strain must be prohibited, and the hours of study and out-of-door recreation prescribed. Social duties, too, are to be relaxed and all that tends to the general well-being of the individual fostered and encouraged. Especially should the effort be made by combined professional and maternal skill and tact to interest the girl in enjoyable out-of-door sports in which self-forgetfulness, abandon, and transporting pleasure shall predominate. Drugs are of little avail beyond stimulating appetite and digestion. The curative effort must be in the direction of securing a surplus vitality and equilibrium of circulation.

In cases that do not yield to this regimen of living one of two courses is open: to prolong the period of relaxation and retirement, with such additional relief by drugs as may be imperative, or submit to a careful examination to discover or exclude organic causes. If the patient is unmarried the examination should always be made under anæsthesia, with preparations at hand to apply whatever treatment may be necessary. If an infantile uterus be present, the uterus should be dilated, explored with a curette to remove any degenerated mucous membrane that may be found, and its cavity packed with sterile gauze. The technique of this procedure is as follows: With the patient in the dorsal position upon the operating table, and the knees flexed upon the abdomen, the hymen is gradually stretched or torn by the insertion of one and gradually a second finger with pressure steadily exerted upon the perineum till the introitus is large enough to receive a small-sized vaginal retractor or speculum. A thorough bimanual examination is now made and the position and conditions of the pelvic organs accurately ascertained. The external parts having been previously sterilized the vagina is now scrubbed with bichloride solution on a cotton or gauze swab. The anterior lip of the cervix is caught by a double tenaculum or a traction forceps and steadily dragged down as far as the ligaments will permit without too great force. The Sims

dilator is inserted and the cervix is dilated to a sufficient degree, usually about a half inch, to allow free use of the curette and irrigation tube. Care must be taken in dilating to make sure that the instrument passes through the internal os. The tendency is for the dilator, while force is being applied, to slip out just far enough to allow the internal os to escape from the end of the dilator and so fail of dilatation. The internal os and adjacent tissue are the individual parts at which this treatment is aimed, and unless they are thoroughly softened and stretched, but not torn, to a degree of paralysis little benefit will be derived. Plenty of time must be given to this step in the treatment. In case of hard cirrhotic cervix fifteen to twenty minutes is not too much time. As soon as the cervix is thoroughly softened and paralyzed the curette, preferable the Sims sharp curette, is passed into the fundus and the entire surface of the endometrium gone over. The curette is a most serviceable instrument when intelligently handled, but may prove most dangerous in unskilled hands. The danger lies in pushing the end of the curette through the uterine wall or in sweeping it from side to side. In the latter instance the tip of the curette acts like the sharp blade of a knife and readily cuts through the uterine wall. No pressure should be made except in the drawing motion. The uterus should be packed with gauze until the cavity is slightly distended and the end allowed to protrude from the external os for an inch or two for convenience in removal. The vagina is then packed lightly with gauze and the operation is completed. This treatment is applicable to cases of imperfect development and endometritis. In displacement of the uterus the treatment will consist of the tampon treatment, the use of a pessary, or some surgical procedure for the cure of the displacement. The treatment of uterine polypi, salpingitis, and fibroid tumors of the uterus are discussed under their appropriate heads. Maiden ladies of mature age are apt to suffer from ovarian dysmenorrhœa. Celibacy is not conducive to the functional life of these organs. The ovaries are deprived of the stimulus that attends married life, pregnancy, and lactation, and suffer from chronic congestion, and early undergo a retrograde change resulting in cirrhosis. If taken in time the circulation may be improved and the process delayed by proper exercise, massage, hot baths, tampon treatment, dilatation, and packing of the uterus. Electricity is sometimes of service. In many instances relief is afforded by removal of the ovaries and establishment of the menopause.

THE MENOPAUSE.

The permanent cessation of menstruation is called the menopause. The period at which this occurs physiologically is between the ages of forty-five and fifty years. These limits are not absolutely fixed. Variations of a few years may occur either way. Women that reach puberty early are apt to cease menstruating early, and those who mature late lack the fullest development, and the menopause comes early. Excess of fat

in women after the age of thirty seems to hasten the menopause. Heredity also determines somewhat the age at which menstruation ceases. The menstrual discharge and symptoms may gradually diminish until they disappear; they may stop abruptly and permanently, or there may occur one or two intervals of amenorrhœa, of two or three months' duration, followed by two or three months of normal menstruation, when the flow and all the symptoms finally cease. Profuse bleeding or slight bleeding, occurring at irregular intervals, or a recurrence of bloody discharge at any time after menstruation has been supposed to cease permanently, are pertinent symptoms of some pathological condition, and demand prompt attention. This is the period at which retrograde changes in the generative organs occur. Uterine polypi and fibroid tumors declare their presence by the above symptoms, and cancer of the uterus is prone to develop. If bleeding occurs after the menopause has been established the presence of cancer should always be suspected. Irregular symptoms of the menopause, however, may be produced by such simple conditions as endometritis and uterine displacements. It must be borne in mind that the cessation of menstruation is a physiological process, and normally should occur without any decided derangement of the general health. Women rarely pass through the period without some unpleasant symptoms. Severe headaches are frequent, and sensations known as hot flashes, more or less severe in character and frequency, fall to the lot of all women. These hot flashes may occur every few minutes, at intervals of several hours, or may be absent for days and weeks. They are evidently due to lack of nervous control of the vascular system. A sense of heat comes on suddenly, the face flushes and nervous sensations creep all over the body. This is followed by more or less profuse perspiration succeeded by chilly sensations. The digestive system becomes deranged, and attacks of mental depression are frequent, in rare instances resulting in insanity.

Treatment.—It cannot be too firmly impressed upon the laity, nor kept too constantly in mind by the profession, that the menopause is the period during which womankind is under the threatening pall of cancer. As she approaches the critical epoch her general health should be brought up to the highest possible standard. Women with large families should have relief from too strenuous household cares, and, if necessary, a change of scene and environment. Fresh air and carefully regulated diet and exercise are important factors. Any irregularity in the menstrual discharge calls for prompt and thorough examination. Cases of endometritis, lacerations of the cervix, and displacement of the uterus demand appropriate treatment. Fibroid tumors of the uterus, when present, should be kept under careful observation. Evidences of continued growths or of degenerative changes are indications for operative interference.

CHAPTER IV.

DISPLACEMENTS OF THE UTERUS.

By J. RIDDLE GOFFE, M.D.

Causes.—Before a proper understanding of uterine displacements can be obtained it is necessary to know what the proper position of the uterus is, what the structures are that maintain it in normal position, and what the forces are which tend to displace it. It is important to keep clearly in mind that the uterus, like all other organs in the body, is suspended by its ligaments. Weight for weight the uterus has more ligaments than any other human organ. It is maintained by some authorities that the uterine ligaments are simply guy ropes to limit its movements in various directions, but the necessity for so many guy-ropes has never been demonstrated. Nature is economical in her provisions for accomplishing definite objects; such an extravagance in guy-ropes is contrary to all her laws and practices. The uterus is a suspended organ, suspended by its ligaments. These ligaments, one and all, contain more or less muscular fibres which are prolongations of the musculature of the uterus. The ligaments, therefore, so far as their muscular structure is concerned, participate with the uterus in its various changes of hypertrophy and subsequent involution. As the uterus enlarges with the growing child the ligaments become hypertrophied. This is especially noticeable in the round ligaments, which become so large and strong that in thin women with relaxed abdominal walls they may be readily palpated from the fourth month of pregnancy to its close. As the uterus involutes after delivery the hypertrophied ligaments also involute to adapt themselves to the original function. Any interference with the process leaves the uterus large and heavy and its ligaments too long to maintain it in its normal position. In this pathological process—viz., subinvolution of the uterus and its ligaments—is revealed one of the most fruitful causes of retrodisplacements of the uterus. The failure of the obstetrician to make sure that the uterus and its ligaments have properly involuted before the parturient woman is allowed to get out of bed and assume her household duties is a frequent cause of sagging and retroversion. When the uterus has firmly contracted and its ligaments involuted to their normal length, the occupation of the woman becomes a minor factor in causing displacement. Malpositions of the uterus are not very common among women where long hours of standing are necessary, but young women in shops and factories frequently suffer from anteflexion, the latter condition being a persistence of the infantile uterus. The second most frequent cause of displacements of the uterus is inflammation of the

PLATE IV.

FIG. 1

Retroposition and Retroversion of the Uterus, with Fixation. Peritoneal adhesions bind the posterior surface of the uterus to the sacrum and rectum, holding the uterus firmly in retroversion and retroposition.

FIG 2.

Retroversioflexion of the Uterus, with Adhesions. The body is adherent in the cul-de-sac. The long axis of the uterus is bent backward and the cervix is directed downward. (Findley.)

generative organs—viz., metritis, salpingitis, and ovaritis. The underlying factor of the displacement in these cases is the extension of the inflammatory process to the ligaments, resulting in fatty degeneration of their musculature and consequent loss of tone and sustaining power. A diseased and heavy tube or ovary gravitates to the bottom of, and forms adhesions in, Douglas' pouch, thus interfering with the nutrition of the uterosacral ligaments, the adhesions meantime contracting and dragging the fundus down.

A severe and sudden fall or jolt has been known to produce an acute retroversion of the uterus, but this is not likely to occur unless the bladder chance to be full at the time and the fundus carried thereby near to the promontory of the sacrum.

RETROVERSION AND RETROFLEXION.

Retroversion is a tipping of the uterus backward from its normal position. The promontory of the sacrum may be regarded as the dividing point between normal and pathological positions of the uterus. Retroflexion, as a rule, is an exaggeration of retroversion. The fundus lying back in the hollow of the sacrum is subjected to undue pressure, which sooner or later bends it backward upon the cervix and forces it down near the level of the internal os, the cervix in the mean time being supported by the tissues in the base of the broad ligaments. At the point of flexion on the under surface pressure atrophy sooner or later supervenes, while in the opposite or upper surface great tension is exerted, thus producing an elongated and redundant wall. The tendency is, therefore, for this malformation to become a permanent condition. This form of the uterus remains even after the organ has been restored to its normal posture in the pelvis. In other cases fatty degeneration may occur at the seat of flexion, thus weakening the tone of the uterine wall and allowing the fundus to change its position from day to day. Coincidently with these processes, the appendages become involved in more or less extensive inflammation, adhesions are formed to the adjacent surfaces of the pelvis, the intestines, and the omentum, by which the fundus becomes anchored in its malposition. The broad ligaments in the mean time may become infiltrated and push the entire organ to either side of the pelvis. Later, contraction in this tissue may draw the cervix to one side or the other.

Treatment of Retrodisplacements.—The majority of gynecologists distinctly hold to the opinion that displacements of the uterus constitute a pathological condition, and in themselves institute secondary pathological changes of serious import. The change of the position of the uterus interferes with its circulation; this mars its nutrition, producing chronic congestion with thickening and enlargement of the connective tissue. Endometritis ensues, often reaching the stage of polypoid degeneration, resulting in disturbance of menstruation, leucorrhœa, pain, hemorrhages, and sterility. Reflex symptoms are also attendant upon this condition, such as indigestion, headaches, and even aberrations

of the mind. The last condition has been observed in cases of movable retroverted uteri, in which the ovaries were prolapsed into Douglas' pouch and sustained the weight of the uterus. It may be accepted then as a rule of gynecological practice, that malposition of the uterus, whether simple or complicated, should be corrected. It should be said in this connection that modern gynecology has stricken anteversion from the list of pathological conditions. Anteversion is normal and in itself never produces symptoms. If symptoms attend an anteverted uterus their etiology must be sought for elsewhere.

The tendency is to exclude anteflexion from the list of malpositions. The essential condition is that of malformation or deformity. As a rule, in these cases the fundus is found in normal position, the cervix being bent sharply forward into the axis of the vagina. The organ is out of shape, but its pose in the pelvis is normal. It requires straightening rather than change of posture or position. Anteflexion, therefore, is to be treated in a distinct chapter by itself. Retroflexion is invariably attended by retroversion, and is usually relieved by the correction of the version.

The treatment of retrodisplacement of the uterus consists in topical applications, mechanical supports, and surgical procedures. Before any measure of relief is undertaken it is essential to determine whether the displacement is complicated or uncomplicated, and, if the former, what the associated pathological conditions may be. If manipulations for the reduction of the displacement are attended by severe pain they should not be persisted in, but attention should be directed to the relief of the soreness and pain. These cases are proper subjects for treatment with hot douches, glycerin tampons, and rest. The hot-water douche combined with the tamponade treatment is of great service in depleting the congested organs, relieving pain and sensitiveness, and even absorbing adhesions, thus setting free a moderately adherent uterus and appendages. The method of application is of vital importance.

In administering a vaginal douche a large quantity of hot water, not less than one gallon at a temperature of 110° to 120°, should be used. It should be administered with the patient lying upon her back and the hips slightly elevated upon a douche pan. The douche bag should be sufficiently high to give force to the current of water, the elevation being from three to five feet. The douches should be administered twice each day, when the tampon is not in the vagina.

In acute cases it may be necessary to continue these douches for several days before applying the tampon.

In chronic cases the tampon and douche treatment may be begun and continued conjointly. The effect of the hot water is to reduce the congestion by contracting the veins and tissues, and thus stimulating the circulation and process of absorption.

The rationale of the tampon treatment is that it assists in these processes by mechanically supporting the uterus, while the exosmotic or hygroscopic action of the glycerin relieves the œdema and congestion by drawing into the vagina the serous exudates from the tissues and capillaries, thus producing a free watery discharge.

The tampon consists of a small ball of loosely packed cotton or lambs' wool, with a string attached about its middle to assist in its withdrawal. The ends of the string are left about six inches long, a double strand of Clark's O. N. T. cotton thread, No. 12, is a very convenient and acceptable material for this purpose. Several of these tampons may be fastened together on a long string at intervals of two or three inches. This is known as the kite-tail or chain tampon.

There are three preparations that are used for saturating the tampon: First, a 10 per cent. solution of ichthyol in glycerin; second, a 10 per cent. solution of boroglyceride in glycerin; third, a preparation of alum, carbolic acid, and glycerin, according to the following formula:

℞—Pulv. aluminis . . . . . 3ss.
Acidi carbolici . . . . . 3ss.
Glycerinæ . . . . . ad Oj.
M. et Sig.—External use.

The indications for these different preparations are as follows: The first (ichthyol and glycerin) is indicated in cases of great sensitiveness and pain. Ichthyol is an analgesic, and sensitive, delicate patients will tolerate an ichthyol tampon when no other can be endured. The ichthyol is objectionable on account of its odor and the staining of the patient's clothing. It is, therefore, used only as long as the patient is unusually sensitive to touch and manipulation. It is then replaced by the second preparation, boroglyceride. This is the standard preparation, and can be used continuously at the strength of 10 per cent. It is antiseptic, depleting, and alterative. The third preparation is indicated in cases of great relaxation of the vaginal wall, in which an astringent is desirable. A multiplicity of small tampons is preferable to one or two large plugs. It is customary to saturate one or two tampons with the chosen preparation, adjust them nicely in the posterior fornix, behind the cervix, and retain them in place by one, two, three or more dry tampons, as may be necessary. The strings are left protruding from the vulva. In office treatment it is customary to apply these every third day. They are left in place for thirty-six or forty-eight hours, when the patient withdraws them, and takes a hot douche. The latter is repeated night and morning, until time for the next treatment.

The withdrawal of the tampon is an important procedure. If it is very large, or two or more of the strings are pulled upon at the same time, it acts like a piston in a pump, dragging down everything behind it, until some air can enter the vagina and relieve the suction. In cases of movable uterus, in which the organ has been replaced previous to the insertion of the tampon, the displacement is invariably reproduced by the procedure. This can be obviated by withdrawing them one by one, beginning with the last one inserted, or the patient may be instructed to insert her finger into the vagina and make sufficient pressure upon the perineum to allow the air to enter as the tampon is slowly and carefully withdrawn. A good device is to insert the douche

tube into the vagina under or at the side of the tampon, and allow the water to distend the vagina during the withdrawal of the balls.

Not only does the tampon serve to relieve the congestive pain and adhesions, but when the uterus has become perfectly movable, so that the displacement can be reduced, the tampon when placed in the posterior fornix and supported there by a column of cotton balls down to the perineum acts like a pessary to hold the cervix up in the hollow of the sacrum, and so tilt the fundus to the front, where it belongs.

Mechanical Supports.—An ingenious device for mechanically holding the uterus in place is the little instrument known as the pessary. At one time the pessary was considered the treatment *par excellence* for displacements of the uterus, and an infinite variety of shapes and curves were introduced, bearing the names of the various inventors. They were also made of various materials, such as block-tin, celluloid, soft rubber, hard rubber, etc. The pessary has gradually fallen into disuse for two reasons: first, because of the unfortunate consequences attending its reckless application, when absolutely contraindicated, by those unfamiliar with its use and proper application, and, secondly, because the pessary fails to cure.

It relieves the displacement as long as the patient wears it, but in the vast majority of cases fails to restore the sustaining power of the uterine ligaments, and when removed the uterus again resumes its abnormal position. It has, therefore, been relegated to the position of a temporary expedient, except in a few selected cases. It has its special indications as a support to the uterus, during the period of involution following parturition. By lifting the uterus in the pelvis the strain is taken off the ligaments, the process of involution in them is facilitated and continued until their sustaining power has been regained. In chronic cases of long-continued displacement the process of involution cannot be inaugurated, so that the position of the uterus is maintained only so long as the pessary is worn.

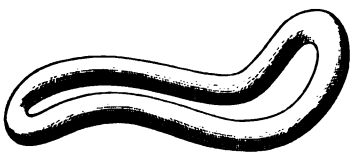
It is generally accepted as axiomatic, in the use of pessaries, that an intrauterine stem should never be used; that no pessary should be inserted in the presence of an unreduced displacement; that no pessary should be adjusted until all local pelvic inflammation has been relieved, and that no pessary should be allowed to remain in the vagina after it begins to produce pain.

The Albert Smith, the Emmet, and the Thomas pessaries (Figs. 60, 61 and 62) are about the only ones that have survived and are now in common use. The principle upon which they act is that they lift the posterior fornix of the vagina high in the hollow of the sacrum and so suspend the cervix. This tilts the fundus to the front and brings the intra-abdominal pressure to bear upon the posterior face of the uterus. In lifting the posterior fornix of the vagina they also take up the slack in the overstretched uterosacral ligaments and allow them to recover their tone. The pessary should not come in contact with the uterus at any point. If the Albert Smith pessary is too narrow at its upper end the uterosacral ligaments may straddle it, and, slipping down either side

of the pessary, allow the cervix to swing to the front and the fundus to retrovert. This is prevented by the Thomas pessary, which has the same shape as the Smith pessary, but has a large bulb at its upper end, which fills up the posterior fornix and prevents the straddling by the ligaments.

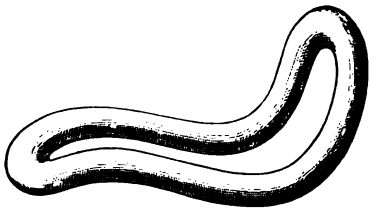
The failure of the pessary to do its work is due to several causes: The uterosacral ligaments may separate and straddle it, as has just been mentioned. The pessary may be too short, and so fail to carry the cervix sufficiently high in the hollow of the sacrum. The instrument may be too small in every way, and so slip down and even out of the vagina. Some persistent bands of adhesion may remain, and so draw the fundus back in spite of the support afforded by the pessary. A

FIG. 60



The Emmet curves.

FIG. 61



The Albert Smith curves.

FIG. 62

The Thomas retroflexion pessary.

lacerated perineum or a greatly relaxed introitus may fail to give the proper support to the pessary. The pessary is held in the vagina by the shape of the canal, which is funnel-shaped from above downward. The instrument is larger at its upper than at its lower end. It also acts as a lever, the posterior curve resting upon the pelvic floor as a fulcrum. The short arm sustains the weight of the cervix above while the long arm is pressed forward against the anterior wall of the vagina. This lever action of the pessary is the principal force that retains it in the vagina. The insertion of the pessary is conducted in the following manner: Place the patient in the dorsal gynecological position, cleanse the pessary with soap and water, and anoint it thoroughly with a lubricant.

Place the pessary in the palm of the left hand with its convex curve downward and the smaller end pointing to the right, grasp the small end between the thumb and index finger of the right hand, the index finger being above, and turn the pessary upon its side ready for insertion.

Insert the index finger of the left hand into the vagina and strongly retract the perineum, pulling it downward and outward. If the introitus is narrow, this is best done by a quick motion, the pessary meantime being inserted half its length into the vagina, still turned on its side and grasped by the right hand. The finger of the left hand is then withdrawn and the protruding part of the pessary grasped by the left hand to prevent its slipping into the vagina. The index finger of the right hand, with the ball of the finger looking toward the left and its dorsum toward the pessary, is then inserted into the vagina and carried along until its tip can be firmly hooked over the cross-bar of the pessary. The left hand lets go its grasp, the index finger of the right hand meantime firmly pressing the cross-bar against the posterior wall of the vagina and carrying it as far into the vagina as the finger can possibly reach. The cross-bar will then slip off the end of the finger and up behind the cervix. The cervix will then be felt in front of the cross-bar as the finger is withdrawn. It is unnecessary to forcibly rotate the pessary in the vagina. The firm pressure of the cross-bar against the posterior vaginal wall will give it the proper pose, and the contractile power of the vagina will carry it into place, provided the cross-bar is pressed firmly enough against the posterior wall to enable it to slip under the cervix.

The pessary should be long enough to reach from the posterior vaginal fornix to about the middle of the urethra, and broad enough to reach the lateral walls of the vagina without putting the vagina on the stretch. Sufficient room should be left on all sides to allow the finger-tip to pass easily anywhere between the pessary and the vaginal walls. Continuous daily vaginal douches are not necessary, but while the pessary is being worn the vagina and pessary should be cleansed for two or three days following each menstrual period, by a daily vaginal douche of boracic acid, 1 drachm to 1 pint.

It is well to have the patient return for examination two or three days after a pessary has been fitted. If at that time it is found to be retaining the uterus in normal position, and gives no evidence to the patient by pain or discomfort that she is wearing an instrument, she may be dismissed for a month or two, with the expectation that all will go well. Positive instructions should be given to the patient that the pessary will need attention from the physician at least every two or three months.

After a pessary has been found to fit properly the only danger from it comes from a tendency, in many cases, to a deposit upon it of acid crystals from the vaginal secretion. These crystals may erode the vagina, producing ulceration, and set up an excessive granulation process that may completely surround the pessary and bury it out of sight and touch. During the past winter a patient presented herself at the author's clinic, who had had a celluloid pessary inserted in

Germany twelve years before. Upon examination the tissues were found to have grown over it so completely that it was concealed from sight and touch throughout its entire extent, with the exception of a half-inch at its anterior end. On the other hand, the author has had patients who were scrupulous in their vaginal hygiene, and who wore pessaries constantly without annoyance for ten, fifteen, and twenty years, with no attention except at rare intervals.

The acid reaction of the vagina varies greatly in different women, and is, after all, the important factor in determining the character and frequency of the cleansing douche. In cases of excessive acidity, common salt or borax, 1 drachm to 1 pint, affords a better douche than the boracic acid solution.

Upon the return of the patient, from time to time, the pessary should be removed and any crystalline deposits upon it scraped off, the pessary cleansed with soap and water, and polished smooth before reinserting, or a new pessary substituted for it. When once the glaze of the pessary has been marred, depositions upon it occur more promptly. The vagina should also be carefully inspected for points of irritation or erosion and treated if found. It may be necessary for a few days to omit the pessary, giving local treatment of healing powders or ointments upon a tampon. In chronic cases the patient should be told, when the pessary is inserted, that the probabilities are against the pessary producing a permanent cure, that she will in all probability be obliged to wear it until after the menopause. At the same time she should be informed that an operative procedure, of which there are many, would probably relieve her at once and permanently.

The Operative Treatment of Retrodisplacement.—A great variety of operative procedures have been devised for the cure of retrodisplacement of the uterus. These may be divided into two classes: first, those which utilize the ligaments of the uterus, and, secondly, those which fasten the fundus or body of the uterus directly to some sustaining tissue. In the first class are shortening the round ligaments by pulling them out of the inguinal canals (Alexander-Adams), and the intrapelvic shortening of the round ligaments by folding them on themselves and stitching them in that position. This may be done through an abdominal incision (Wylie, Mann, Dudley) or through a vaginal incision (Dührssen, Mackenrodt, Goffe) or by the plans of Noble, Ferguson, Simpson, or Gilliam. In the second class are: suspending the fundus uteri from the anterior abdominal wall (Olshausen, Tait); suspending the fundus uteri from the abdominal peritoneum, ventrosuspension (Howard Kelly); stitching the fundus to the anterior vaginal wall, vaginal fixation (Schucking, Dührssen), and shortening the uterosacral ligaments, either through the abdominal or the vaginal incision (Goffe, Bovée).

Those who accept the teaching that the ligaments are the normal supports of the uterus infer that these structures constitute the proper tissue to use in operation for the relief of retrodisplacements. Gynecologists are pretty uniformly agreed that the ligaments which serve

the most important function in supporting the uterus is the sling of tissue, known as the uterosacral ligament, reaching from the sacrum to the posterior wall of the cervix, plus the uterovesical ligament reaching from the anterior wall of the cervix to the symphysis pubis. This is reinforced by the cellular tissue and muscular fibres in the base of the broad ligaments. So long as the uterosacral ligaments retain their proper tone and length, swinging the cervix high in the hollow of the sacrum, retroversion of the uterus is impossible.

It is to some malign influence affecting the uterosacral ligaments, therefore, that we must look for the cause of retrodisplacements of the uterus, and it is consequently to the repair or recovery of function in the uterosacral ligaments that we must look for restoration to normal conditions. This recovery of function of the uterosacral ligaments may be attained by removing the strain upon them through an operation upon some other structure, or it may be secured by direct operative procedure upon the uterosacral ligaments themselves. The shortening of the uterosacral ligaments is the latest surgical device for relieving retrodisplacement, and, being the last in the process of evolution, is the best. It is somewhat difficult of application, and when done through the vagina is applicable only to cases of extreme relaxation of the vaginal introitus. The technique is as follows: With the patient in the dorsal gynecological position, or the extreme lithotomy position, and a self-retaining perineal retractor in place, the cervix is grasped with a vulsellum forceps and drawn strongly forward. An anteroposterior incision in the middle line is made through all the structures of the posterior vaginal fornix, extending down to the peritoneum and reaching from the cervix to the rectum. The ligaments may be seen on the stretch at either side of the incision, and may be dissected out and shortened without entering the peritoneal cavity. Bovée then grasps one of the ligaments midway between the extreme points to be united and, lessening the traction on the cervix at the same time, brings down the fold of the ligament into the vagina. Then a curved needle armed with kangaroo tendon is passed through the ligament at the extreme points noted, and another through the tip of the loop and through the posterior portion of the cervix below the insertion of the ligaments. When the other ligament has been treated in a similar manner the two deep sutures are tied and then the others. The wound is now spread well open and closed transversely to the original incision. When adhesions exist in the retrouterine space the cul-de-sac must be entered and the adhesions separated. Goffe makes a transverse incision through the vaginal wall posterior to the cervix, then enters the peritoneal cavity by an anteroposterior incision. The uterosacral ligaments with their peritoneal coverings are brought into view by moving the cervix backward and forward. The work is then done from the peritoneal side. A point on the ligament midway between two extreme points to be united is grasped with the forceps and the ligaments dragged down in a loop into the vagina, the traction on the cervix meantime being somewhat relaxed. A short, round-pointed, slightly curved

needle armed with twisted silk, No. 2 or 3, is passed through the ligament at selected points, and a second through the two arms of the loop and through the tissue at the cervical origin of the ligament. These sutures are left long until the other ligament has been treated in a similar manner, when the sutures are tied, beginning with the first one passed in each ligament, respectively. If adhesions have been separated the wound may be left open and a small strip of gauze passed into the cul-de-sac for drainage; otherwise the wound is closed. This procedure is fortified in all cases by opening the anterior fornix at the same sitting, and shortening the round ligaments. This operation from the standpoint of the patient is certainly a simple one. It is free from danger, entails no hardships during convalescence, except that of remaining in bed for two weeks, and promises as good if not better results than any other procedure for the relief of this condition.

Bovée, who has carefully investigated the literature of the subject, has found a total of 92 reported cases in which shortening of the uterosacral ligament, either alone or with some other procedure, was done for retrodisplacement or prolapse of the uterus. He says: "I am sorry the exact results cannot be given, but one who studies the reports will be inclined to believe no other procedure can be more reliable."

The condition of a short anterior vaginal wall so frequently attends long-standing and especially congenital cases of retrodisplacement that an important adjunct of this operation consists in severing its attachments to the anterior lip of the cervix and attaching it by suture to the uterus at a higher level. This allows the cervix to swing back into the hollow of the sacrum, as the uterosacral ligaments are shortened, and at the same time brings the pull of the anterior vaginal wall higher up on the face of the uterus.

The operation of shortening the uterosacral ligaments may be done through an abdominal incision. Those who are more familiar with the abdominal route will doubtless find that the more convenient method of procedure.

In cases of small vagina the abdominal route will afford greater facility for the work. The technique of shortening the ligaments is the same whichever route is chosen. Facility in shortening the uterosacral ligaments is acquired by experience with the operation, and, as it is founded on the most approved scientific principle of suspension of the uterus, it is destined to become the favorite operation as it is the most ideal.

SHORTENING THE ROUND LIGAMENTS.—At the present time the round ligaments are the favorite tissue used in operations for the relief of retrodisplacement, the object aimed at being to shorten the ligament and so restore its function of holding the fundus to the front. The natural consequence of this is to take the strain off the uterosacral ligaments and allow them to recover their tone. Unless this follows, the uterus will hang by the shortened round ligaments, an unnatural function for those ligaments, and eventually be forced down and retroverted. The devices that have been employed for shortening the ligaments are manifold. Some authorities recommend shortening them at

the uterine end, some at the distal or inguinal end, and others shortening them somewhere along their course—the intrapelvic shortening. These results are accomplished by doubling the ligament on itself, by hitching up a loop to the abdominal wall, or by attaching a loop by the vaginal route to the vagina.

Of all these methods, the one most generally used at the present time is the Alexander. The objections to the Alexander operation are its limited field of application and the fact that it involves two incisions in the abdominal wall. It is contraindicated in cases of diseased appendages and in the presence of adhesions. The patient should not be too old or too fat, the uterus should not be too large or heavy, nor should there be a prolapse. Its field of application may be extended by making a vaginal incision in advance of the operation and setting the uterus free and even treating the diseased appendages. The technique of the operation is as follows: The immediate field of operation and the surrounding parts are prepared as for an abdominal section. The method of steadying the parts and making the incision is important as bearing upon the discovery of the ligament as it comes through the external ring. In making the incision upon the right side, the operator, standing on the patient's right, places his index finger upon the pubic spine, the thumb upon Poupart's ligament, about an inch and a half intervening. The finger and thumb are moved obliquely upward and outward about half an inch and an incision is made midway between them through the skin, the fat, and superficial fascia down to the deep fascia; all bleeding points should be controlled. The fascia is then incised through the pillars of the external inguinal ring. By carefully retracting the edges of the wound with sharp-pointed retractors, but not sufficiently to disturb the relation of the deeper structures, the round ligament will usually be seen as a tendinous and muscular cord, running along the floor of the canal. At its outer side may be detected the genitocrural nerve which accompanies it in its course. This should be separated from the ligament and avoided in the subsequent procedures. The ligament is now picked up by a blunt hook, taken between the thumb and finger, and gently drawn out of the internal ring, the peritoneal investure being slipped back as the ligament is drawn out to the extent of three or four inches. One ligament being extracted, the wound is covered with a pad of gauze, and the same procedure executed upon the opposite side. In making the incision the operator now places his index finger upon Poupart's ligament and his thumb upon the pubic spine before moving them obliquely upward and outward. Both ligaments are then grasped and pulled upon until the fundus is felt palpating against the abdominal wall.

The ligament is now severed at its lower end, drawn down, laid along the bottom of the canal, and sutured in that position with chromicized catgut, No. 2, to the pillars of the canal and external ring. The suturing may be continuous or interrupted. The redundant portion of the ligament is then cut away and a second tier of buried suture unites the edges of the fascia over the ligament, the skin wound being closed by interrupted sutures of fine silk. The wound may

then be dressed with iodoform gauze and adhesive plaster, a binder being placed over all, or the operator may indulge in any of the special refinements for dressing wounds, such as silver-foil, collodion, or other devices. It is of the greatest importance to protect the wound from infection, otherwise suppuration is apt to occur, with the danger of subsequent hernia. Hernia following an Alexander operation occurs in from 5 to 15 per cent. of all cases. Nothing can be more mortifying to an operator than to have a patient upon whom he has operated for the relief of simple displacement of the uterus return to him in the course of a year or two with a single or double hernia through the Alexander incision.

It must be borne in mind that the Alexander operation is subject to certain unforeseen complications. Adhesions are sometimes encountered in the inguinal canal, effectually preventing the drawing out of the cord. The cord is at times so delicate that it is unable when separated from its attachments to resist the strain, and breaks. The rupture sometimes occurs at the horn of the uterus. Mann and Bovée point out that in a few instances the cord has been found not to run through the inguinal canal. All of these complications necessitate the resort to some other procedure to complete the operation. The after-treatment consists in regulating the bowels and keeping the patient in bed for ten days to two weeks. Unless a rise of temperature intervenes the dressings are not removed until the end of that time. The patient may then be allowed to sit up and go about as soon as her strength will permit. It is the custom of most operators to insert a retroversion pessary at the time of operation and leave it in place for two or three months.

No complication during subsequent pregnancies has been reported as the result of the Alexander operation.

INTRA-ABDOMINAL SHORTENING OF THE ROUND LIGAMENTS.—This operation was first suggested by Wylie. In the matter of its technique it has been modified by Mann, Dudley and others. These operators use the abdominal route or incision for reaching the round ligaments. This route of attack has been transferred by Goffe, Byford, Dührssen, Mackenrodt, Bovée and others to the vaginal route, the method of dealing with the ligaments being the same. This operation has a far wider scope than the Alexander, being free from all its limitations. The abdominal incision, and the vaginal section as well, enables the operator to deal with all complications, such as adhesions, diseased appendages, etc. At the same time its results are, in every particular, as satisfactory as those of the Alexander operation. It does not complicate subsequent pregnancies in any way, and the incision is much less apt to become infected and result in hernia. By the abdominal route the technique is as follows:

The incision through the abdominal wall is made in the median line and varies in length in accordance with the pathological conditions of each individual case, a simple case requiring only a short incision, complications making it necessary to extend this to any desirable degree. Any adhesions that may be present are separated, and any operation that may be indicated is performed upon the uterus or appendages.

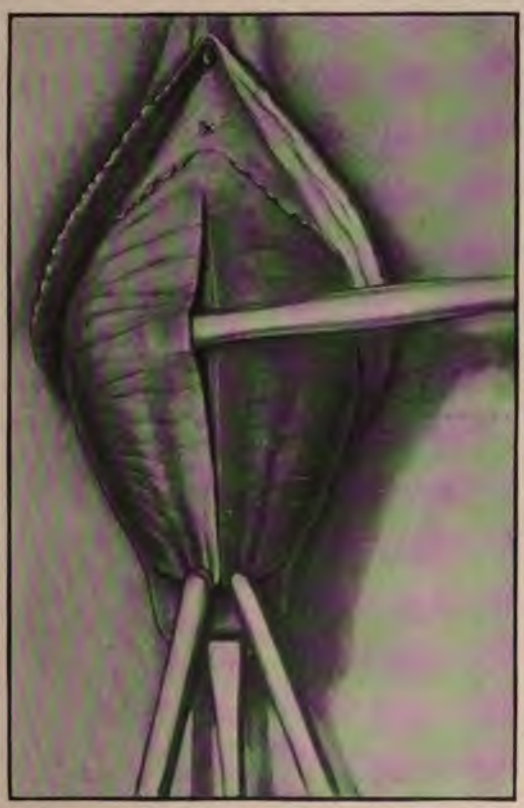
With the patient in the Trendelenburg position the abdominal walls are retracted and the intestines protected by a large abdominal pad. The uterus is seized by a double tenaculum and drawn up to the abdominal wound. The round ligament of either side is made tense by pulling the uterus to the opposite side and is then grasped near its middle point with an artery clamp and drawn up in a loop toward the abdominal incision. A short, slightly curved, round-pointed needle armed with twisted silk, No. 3, is passed through the round ligaments at a point about midway between the clamp and the internal ring, and also at a point between the clamp and the uterus, at such a distance from the clamp as when approximated to the first point it will draw the fundus to the middle line of the body. The loop of ligament still grasped in the clamp is then carried toward the origin of the round ligament and the three strands of ligament thus lying parallel to each other are stitched together by two or three silk sutures. If the loop reaches to the uterus the tip is stitched to the uterus at the point of contact. The ligament of the opposite side is treated in a similar manner. The abdominal pad is now removed and the abdominal wound closed in the usual method. Silk is much the best material to use as a suture in the round ligament. It is soft and pliable, produces no irritation by its presence, and is sufficiently permanent to hold the ligament until enduring adhesions have formed. The usual after-treatment for cases of abdominal section is carried out.

Shortening the Round Ligaments through the Vagina.—The operation as described above may be done through the vagina and thus save the woman the discomfort, the danger, and the possible unfortunate consequences that may come from laparotomy.

The scope of the vaginal method in these cases embraces not only simple retroversion but all inflammatory complications that are amenable to operative treatment. The technique of the operation is as follows: With the patient in the dorsal gynecological position and a posterior vaginal retractor in place, the cervix is seized with volsellum or traction forceps and drawn down strongly toward the outlet. A transverse or semilunar incision is made through the vagina in front of the cervix as for vaginal hysterectomy. Through this incision the bladder is dissected from the uterus with the finger and the handle of the scalpel up to the vesicouterine pouch. The edge of the transverse incision is seized by two hæmostatic forceps at either side of the middle point, and sufficient tension made to put the anterior vaginal wall upon the stretch. An incision through the vaginal wall is then made with the knife from the neck of the bladder to the middle point of the transverse incision (Fig. 63). Through this incision the bladder is dissected free from the vaginal wall upon either side. The hemorrhage is slight and is usually controlled by hot-water irrigations or sponge pressure; any spurting vessel that may appear is seized and tied. The hæmostatics are removed and the finger forced through into the peritoneal cavity between the bladder and the uterus. The second index finger is also carried through the opening and by pressure in opposite directions the peritoneum is

torn across the face of the uterus and out into the broad ligaments. Through this incision, with the assistance of firm traction upon the cervix, adhesions may be reached and separated by the finger. The index finger is then hooked over the free border of one broad ligament and carried down its posterior face until it can compress the round ligament against the thumb of the same hand, which has been opposed to it in front of the broad ligament. With the round ligament so grasped the horn of the uterus is dragged forward and downward into the vagina,

FIG. 63



The two incisions in the vagina have been made, and the bladder and vaginal wall are being separated.

the cervix in the mean time being pushed back into the hollow of the sacrum and the traction forceps released. If the bladder interferes with this manœuvre it can be pushed up out of the way by the finger or a small retractor.

During the process of breaking up adhesions and delivering the fundus into the vagina the perineal retractor is removed from the vagina, as well as all other retractors. The perineal retractor is now reintro-

duced and a lateral retractor also in that side of the vagina on which the round ligament is to be shortened first. By raising the fundus between the thumb and finger, and sliding the finger along the posterior face of the broad ligaments, the different structures there may be brought into view. On a line with the extreme end of the fundus and running out on to the broad ligaments is the Fallopian tube. This must not be pulled upon or handled roughly.

Pressing the broad ligament forward and following it down with the

FIG. 64

Shortening round ligaments by vaginal route. Drawing down left round ligament and passing first suture.

eye along its anterior face the round ligament will be seen. This should be followed out toward the internal ring and grasped with a hæmostatic forceps about two or two and a half inches from the uterus and dragged down in a loop. A short, round, pointed, slightly curved needle (Goffe's round-ligament needle), armed with No. 3 twisted silk, is passed through the round ligament at a point near to the horn of the uterus and at a second point as remote from the forceps on the distal side as will permit of approximation to the first point, when the suture is tied, thus shorten-

ing the round ligament to an extent equal to the length of tissue taken up in the loop (Figs. 64 and 65).

This varies from two and a half to four inches. The loop of tissue is now turned toward the uterus, and laid along parallel with the ligament between its suture and its origin. Two silk sutures are then passed through the two strands of ligament lying parallel to each other, and a third one fastens the tip of the loop to the uterus (Fig. 66). This horn of the uterus is then allowed to resume its position in the pelvis. The other horn of the uterus is drawn into the vagina, and the ligament

FIG. 65

Shortening round ligaments by vaginal route; two sutures tied.

grasped as on the other side. The finger is then passed over the broad ligament of this side and the round ligament seized by a hæmostatic forceps, as in the first instance. The fundus is now restored to the peritoneal cavity. This permits of more slack being taken in the ligament than could be accomplished if the fundus remained in the vagina. This is due to the fact that as the ligament is shortened the fundus is drawn upward and forward into its normal position above the bladder. The ligament is then treated in a similar manner to the first. The

bladder is now adjusted to its normal position, the vesicouterine peritoneum being drawn down in front of the uterus. The longitudinal vaginal incision is closed by interrupted sutures of chromic gut No. 2.

The attachment of the anterior vaginal wall is carried up on the anterior face of the uterus to a point sufficiently high to lengthen the anterior vaginal wall and at the same time bring the pull of the utero-vesical ligament well up on the long arm of the lever. It is fastened there with a stitch of chromic gut No. 2.

FIG. 66

Shortening round ligaments by vaginal route; three sutures tied.

If there has been much oozing and drainage seems desirable the transverse incision is not closed, but one suture is applied at either end of the incision, it being passed deeply enough to control the blood supply from that direction.

The vagina is now packed quite firmly with gauze, attention being given in inserting it so that the cervix will be carried high in the hollow of the sacrum. This gauze is left in place for three or four days and

then removed. It is the invariable custom to curette and pack the uterus as the first step in the treatment of all this class of cases. The uterine gauze is removed at the same time with the other. After the gauze is removed the only after-treatment consists in vaginal douches of boracic acid solution twice each day, at a temperature of about 100°. Douches of high temperature tend to soften and disintegrate the catgut sutures too promptly.

In simple cases the patient can be out of bed on the tenth to the fourteenth day; in complicated cases the patient is confined to bed from two to three weeks.

VAGINAL FIXATION OF THE UTERUS.—In 1890, Dührssen, of Berlin, Germany, described a method of curing retrodisplacements of the uterus by stitching that organ to the vagina, and gave it the name of vaginal fixation. He was promptly followed in the use of the procedure by other operators, notably Wertheim, of the same city, and soon a large series of cases were reported.

Anatomically and symptomatically the procedure gave entirely satisfactory results. The fundus remained in an anterior position and no unpleasant complications supervened. The functions of the bladder were not affected in any way. It was found, however, that in the subsequent pregnancies that occurred in a number of these patients serious difficulties arose at parturition.

In a few nothing more than varying degrees of dystocia occurred. Others, however, resulted in rupture of the uterus and death, while not a few were rescued from this extremity by Cæsarean section. This unfortunate experience with the operation quickly threw it into disrepute, and it was promptly abandoned.

After the immediate revulsion had passed a careful and discriminating review of the work disclosed the fact that the error did not lie in the principle of the operation but in the details of its execution. The stitches had been inserted too high in the anterior wall of the uterus, dragging the fundus down too low, and consequently tilting the cervix up too high in the pelvis. The result was that when pregnancy ensued the cervical canal could not turn forward into the axis of the vagina, and childbirth was impossible. In some the cervix even pointed above the promontory of the sacrum. It has been found by subsequent experience that stitches passed not nearer the fundus than the middle point of the anterior body of the uterus are efficient in retaining the uterus in the anteverted position, and obviate the disastrous consequences of the earlier operations. Operators are more or less timid, however, about passing sutures through the body of the uterus, and more or less uncertain regarding the exact point at which the sutures when passed will be efficient, and at the same time free from danger. An effort was therefore made to obviate this objection, and at the same time adhere to the vaginal section and the general principle involved, by dragging down the round ligaments at a selected distance from the uterus and fastening them to the vaginal wall. This gives the fundus greater freedom of movement and obviates in subsequent pregnancies

the disastrous results of vaginal fixation as originally done. This modification has been practised by Dührssen, Wertheim, Vineberg, and others, with entire satisfaction to the operators.

VENTRAL FIXATION AND VENTRAL SUSPENSION.—These operations both imply a fixation more or less intimate of the fundus of the uterus directly to the abdominal wall.

Fixation implies a firm attachment of the fundus to the peritoneum or the structures of the abdominal wall extraperitoneally; that is, the peritoneum may be pushed aside and the fundus brought directly in contact with the fascia of the linea alba. The distinction between fixation and suspension consists in the following: in fixation the retaining suture includes other structures of the abdominal wall than the peritoneum, while in suspension the retaining suture includes the peritoneum only. Both operations involve a laparotomy. In both the point of attachment should be as near to the symphysis as will not interfere with the functions of the bladder. In both operations it is customary to pass two sutures, one at the fundus and the second a quarter of an inch below, on the posterior aspect of the uterus. In fixation the suture is passed first through the fascia and other tissues of the wound, then through the uterus, taking a good strong bite, then through the corresponding structures of the opposite edge of the wound. This operation should never be done in cases in which pregnancy may occur. It is applicable in patients past the menopause, to relieve prolapsus and in cases of retroversion in which the uterine appendages have been removed.

In ventral suspension the peritoneal surface is everted through the wound. In passing the suture the needle enters the inner surface of the peritoneum about a quarter of an inch from its edge and emerges about the same distance from the point of entrance. It then catches up the uterus and finally the peritoneum of the opposite side, reversing the positions of the point of entrance and exit. Two sutures are passed in this way, and the abdominal wound is closed in the usual fashion. The result of this method of attachment is that the weight of the uterus gradually pulls down and stretches out the peritoneum into the bands described by Kelly as "suspensory ligaments." These suspensory ligaments are supposed to obviate the objections to fixation, as they afford mobility to the uterus. The objections to the operation are the uncertainty as to the extent to which these ligaments will be drawn out and the danger of subsequent intestinal obstruction. The author has operated upon a patient four months after abdominal suspension had been done and found the fundus in the hollow of the sacrum, the lax bands or ligaments being four and a half inches in length. The suspensory ligaments must elongate during gestation, but having no muscular structure do not involute with the uterus, and so afford no guarantee of any support thereafter. Moreover, in some cases of pregnancy these ligaments have failed to elongate, as the uterus enlarged in gestation, and it has been necessary to open the abdomen and cut them in order to avoid threatened miscarriage.

FIXATION OF THE CERVIX.—The attempt has been made by many operators to relieve retrodisplacement of the fundus by fastening the cervix back to the hollow of the sacrum.

Surfaces have been denuded on the posterior lip of the cervix and posterior wall of the vagina and then stitched together. Another method is to open into Douglas' cul-de-sac and obliterate it by causing adhesions to form between the cervix and surrounding structures. Pryor developed this idea to an elaborate system. The plan consists in opening into Douglas' pouch and thoroughly packing and repacking this space and the vaginal wound with gauze until the space is completely filled with granulation tissue. This contracts and secures the cervix firmly to the rectum and to the uterosacral ligaments. The cervix becomes anchored in a high and backward position. Into the vaginal opening a wick of gauze is passed so as to reach just above the cut edges, about this enough strips are placed to fill the incision in the vagina. This gauze plug, together with the cervix, is now pushed high into the hollow of the sacrum, the fundus coming to the front. Small pieces of gauze are now inserted at the sides of the cervix until the vagina is filled down to the margin of the levator ani muscle. A hard roll of gauze, as thick as one's thumb and long enough to distend the vaginal wall from side to side, is next placed. This is made to fit transversely in the vagina in front of the cervix and act as a support to hold up the cervix and the plug of gauze above. This Pryor called his gauze pessary. This pessary should be so arranged as to permit the removal of any packing that may have been placed in the uterus. In seven to ten days all dressings are removed and replaced exactly as at first. The third dressing is applied a week later, and these dressings are repeated until the raw surface at the vaginal vault has completely healed. The supporting pessary is used for six weeks, and is then replaced by a hard rubber pessary which is so shaped as to keep the cervix backward by pushing against its anterior lip, and without bearing upon the posterior scar. This instrument is worn for several months.

The author does not approve of the Pryor operation. It is based on a false principle, and frequently produces lasting ill effects.

ANTEDEVIATIONS OF THE UTERUS.

As has been said elsewhere, anteversion of the uterus has been stricken from the list of pathological conditions. The promontory of the sacrum may be regarded as the dividing point between the normal and pathological positions of the fundus. The important factor in the case is the mobility of the uterus. In the early days of gynecology, before the inflammatory complications which are now so well understood were known, anteversion was treated as systematically as retroversion.

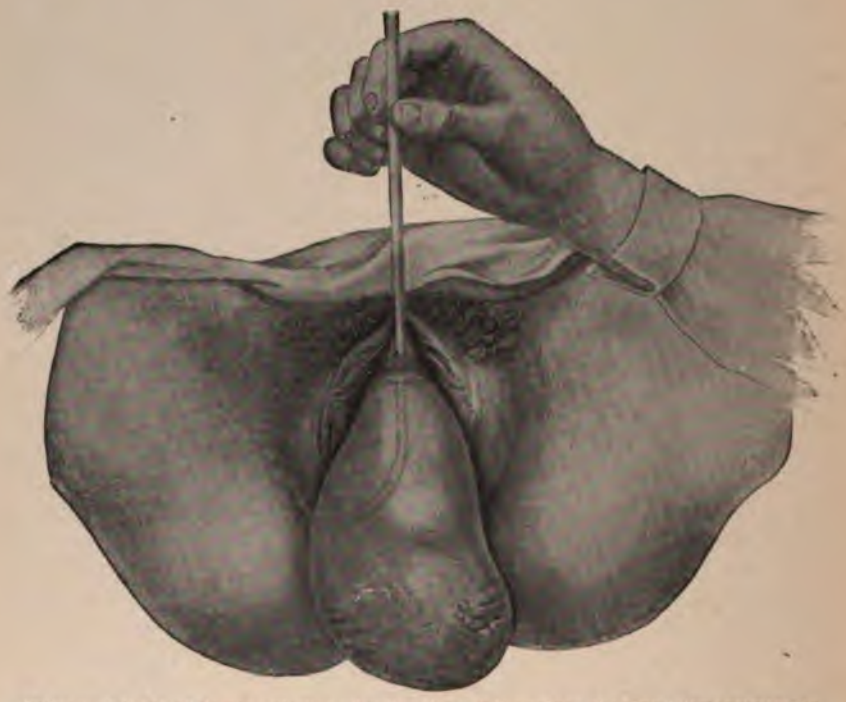
Anteversion pessaries were constructed, and prominent gynecologists vied with each other in inventing ingenious instruments for holding

up the anteverted fundus. These were notoriously futile in relieving symptoms, and as time went on it was gradually recognized that not anteversion but some local inflammation was the cause of the symptoms.

PROLAPSUS UTERI.

All retrodisplacements of the uterus involve a certain amount of descensus below the normal plane of that organ. When this descent of the uterus reaches such a stage in its progress that the cervix presents

FIG. 67



Prolapse of the third degree; uterus protruding through the vulva; the sound demonstrates the bladder to be in complete descent with the uterus. (Schaffer.)

at the vulva or protrudes through it the condition is called prolapsus. This descent of the uterus may progress to such a degree that the entire organ is outside of the vulva, procidentia (Fig. 67).

Eversion of the vagina attends this, and the bladder and rectum also may be found in the external mass of tissue. This condition is called total prolapse or procidentia. In some instances the cervix may appear without the vulva and eversion of the vagina be complete, while the fundus remains at or near its normal level. In total prolapsus complete evacuation of the bladder is impossible. The residual urine undergoes

decomposition; infection occurs, producing the unfortunate succession of cystitis and ureteritis, eventually reaching the kidneys and exciting a fatal pyelitis.

Etiology.—In childbearing women prolapse of the uterus can usually be traced to subinvolution of the uterus and its ligaments, following parturition.

The uterosacral ligaments have failed to involute, allowing the cervix to slip downward and forward into the axis of the vagina. Intra-abdominal pressure and the weight of the uterus gradually crowd the fundus down into the hollow of the sacrum, thus overcoming the sustaining power of the round ligaments as well as the connective tissue of the broad ligaments. This descensus of the uterus carries down the anterior vaginal wall and the bladder. These in turn drag upon the cervix and assist in the general prolapse. In these cases there has been a laceration of the perineum and the levator ani muscle, resulting in the prolapse of the posterior vaginal wall, a rectocele. Eventually these two forces, the dragging below and the intra-abdominal pressure above, carry the uterus and the adjacent tissue outside the vulva. The pressure is hastened by the absorption of the pelvic fat, as age advances, and the muscular atrophy of the uterine ligaments and the pelvic floor. If the round ligaments resist the descent of the fundus the loss of tone in the uterosacral ligaments and injuries to the pelvic floor may still permit of complete eversion of the vagina, with protrusion of the cervix at the vulva. These are the cases which present extraordinary elongation of the uterine body. The condition may exist even after a firm ventrofixation of the fundus. The lower uterine segment elongates, *pari passu*, with the increasing strain.

Prolapse is sometimes met in nulliparous women and even in virgins. In these cases the conditions may be congenital or may have been produced by an elongation of the supravaginal portion of the cervix and lower segment of the uterus. This condition is frequently accompanied by a fibroid tumor.

Symptoms.—The symptoms are the dragging pains such as would naturally attend such a condition, with backache, difficult locomotion, and sharp pain on sitting. In extreme cases there is more or less dribbling of urine, with irritation of the inner surfaces of the thighs and more or less erosion of the protruding mass.

Upon examination with the patient in the gynecological position, if the prolapse is total the condition becomes apparent at once. In cases of partial prolapse the degree of displacement can be appreciated only by examining in the standing posture. In either event, it is well to replace the organ and to make a thorough examination of the pelvis by the bimanual method. Occasionally, it may be difficult or impossible to return the prolapsed mass within the pelvis. This may be due to œdema and congestion, which should be relieved by rest in bed, with the foot of the bed elevated, if necessary.

The parts should be well anointed with a lubricant, when by gentle manipulation and pressure upon the cervix, in the axis of the vaginal canal, reduction is finally accomplished.

Treatment.—Temporary relief may be obtained by reducing the mass and inserting into the vagina a large tamponade, the first two or three tampons being saturated with boroglyceride and the balance dry. This will give relief, and may be successful in retaining the prolapsed parts in the pelvis when the patient is upon her feet, provided she wears a snug "T" binder. In cases of slight prolapse the parts may be temporarily retained by a large, soft rubber ball or ring pessary, or by a Gehrung pessary. All contrivances, such as ball or cup pessaries, supported by an abdominal belt and perineal bands, are dangerous and not to be recommended. The only permanent cure consists in some surgical procedure.

The nature of the operation depends upon the age of the patient and the degree of prolapse. In patients beyond the menopause, in which the condition is due to atrophic changes, there is no hope of the tissues regaining their tone, and permanent cure rests in complete hysterectomy, a narrowing of the vaginal canal, and the construction of a strong perineal support. A good device which the author has practised successfully for a number of years, although not original with him, consists in making a deep incision down both lateral sulci of the vagina, and after the uterus has been removed drawing down the broad ligaments and suturing them fast in the V-shaped opening thus made. Sufficient traction should be made upon the ligaments while they are being sutured to permit of their retraction, thereby drawing up the vagina into the pelvis when they are released from the traction forceps.

In childbearing women elongated and hypertrophied cervices should be amputated to lighten the uterus as much as possible and induce involution. In these cases success is frequently attained by adding to the amputation of the cervix the shortening of the uterosacral and round ligaments by the vaginal route, the narrowing of the vaginal canal by anterior colporrhaphy that shall include the fascial sheath of the vagina and a restoration of the pelvic floor. A number of patients that have been subjected to these procedures by the writer have been relieved of their suffering and have successfully borne children thereafter. Some operators in dealing with these cases prefer to do a laparotomy and a ventral fixation of the fundus, relieving the dragging sensation by narrowing the vagina and restoring the pelvic floor as previously mentioned. Freund's operation for obliterating the vagina has not met with general success, but for intractable cases in which the condition has recurred, after a trial of simpler procedures, such as those mentioned above, Edebohls has proposed and practised a complete removal of the uterus and the vagina, stitching the rectum to the bladder wall by buried sutures in successive layers throughout the vaginal bed.

PLATE V.

FIG. 1.

Primary Prolapse of the Uterus. The uterus lies wholly outside the vulva. The vaginal walls are completely inverted; the cervix is not elongated. (Findley.)

FIG. 2.

Anteflexion of the Uterus. The uterus is bent forward upon its long axis. There is very little alteration from the normal. A subperitoneal fibroid on the anterior wall forms a sharp angle, resembling an anteflexed uterus. (Findley.)

ANTEPOSITIONS, ANTEVERSION, AND ANTEFLEXION OF THE UTERUS.

The uterus may be out of its normal position in the pelvis, being pushed forward by a variety of pathological conditions. These may consist of a large fecal mass in the rectum, an abscess in the Douglas pouch, a retrouterine hæmatocele, or a fibroid tumor; the symptoms of this displacement are those of the causative pathological conditions, of which irritability of the bladder will probably be a marked feature. The malposition is usually corrected by the removal of the cause; no treatment need be directed to the uterus itself. Anteversion is the normal position of the uterus. When existing to an abnormal degree it is due to some pathological condition unrelated to the sustaining ligaments of the uterus. These should be discovered and receive attention.

Anteflexion is the bending of the uterus upon itself with the concavity of the flexion toward the front; a certain degree of anteflexion is normal, and, except in marked cases, it becomes a nice question when the flexion exceeds what is normal. Anteflexion may be either congenital or acquired. If the condition is congenital the uterus is unusually small and bent markedly upon itself, the body and the cervix both pointing in the direction of the pelvic outlet. The cervix is elongated and situated in the long axis of the vagina. The fundus is, therefore, about in normal position, the cervix being bent upon it rather than the fundus bent upon the cervix.

This is the normal shape of the uterus during infancy, the infantile uterus. The persistence of this form does not represent, therefore, a defective fetal construction but failure to develop at the time of puberty. This lack of development pertains also to the vagina, the ovaries, and the Fallopian tubes. Acquired anteflexion is not so extreme as the congenital. It is due either to an unequal involution of the uterine walls, by which the anterior wall has involuted more rapidly, or to a more extreme degree, than the posterior; to an abnormally soft, pliable condition of the uterine walls allowing the fundus to drop forward and the cervix to turn to the front, or to increased weight from a fibroid at the fundus. Some authors insist that this condition is due to a contraction of the uterosacral ligaments following a postuterine inflammation. It is quite possible that contraction here may lift an anteflexed uterus upward and backward, but that the lifting of the cervix by these ligaments should cause anteflexion is not only theoretically impossible, but as Dudley says, "one is often disappointed in his search for evidence of such inflammation associated with pathological anteflexion." Anatomically, the origin of the uterosacral ligaments is so low down upon the cervix that contraction in them should lift the cervix and resist its inclination to turn forward rather than favor it. Periuterine inflammations may so interfere with the nutrition of the uterine walls as to permit of flexion in any direction.

Symptoms.—The symptoms of anteflexion, whether of the congenital or acquired form, are usually associated with the menstrual function. Dysmenorrhœa is a notable symptom in all cases, and in married women sterility is apt to accompany it.

When short uterosacral ligaments exist, which draw the uterus upward and backward, the vesicovaginal wall is put upon the stretch, causing traction upon the neck of the bladder and urethral symptoms. Little stress need be paid to the possibility of the weight or position of the fundus interfering with the function of the bladder. The faculty which the bladder possesses of adapting itself, without resentment, to extreme conditions of pressure and distortion, in cases of multiple fibroids and inflammatory conditions, militates against the probability of an anteflexed fundus producing bladder symptoms. The dysmenorrhœa which accompanies anteflexion is due not only to the constriction interfering with the escape of the menstrual blood, thus causing uterine pains, but to the unrelieved congestion occasioned by lack of development throughout the entire generative apparatus. This applies especially to a congenital form. A retention endometritis is usually present in these cases.

Dudley points out that sterility attends these cases, not so much from failure of impregnation, as from the fact that the ovum, if impregnated, is unable to survive in the hostile environment of an infected endometrium.

A fibroid tumor in the anterior wall of the uterus may present, to the examining finger, a condition so identical to that of anteflexion that it may be readily mistaken for it. Conjoined examination will usually correct this impression. If this is not conclusive a uterine sound may be passed to the fundus.

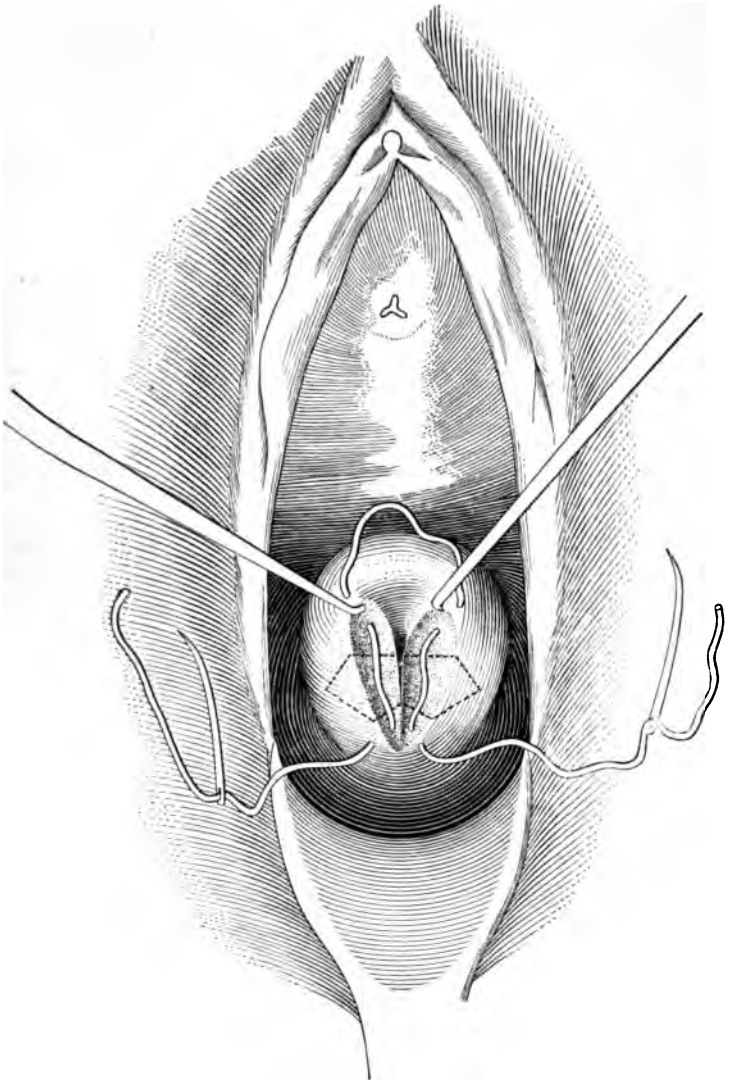
Treatment of Anteflexion.—If this condition be complicated by inflammation of the uterus or the surrounding structures the treatment of the inflammation becomes the prime indication. Direct treatment of the malformation is contraindicated until the inflammation is relieved.

The standard treatment of anteflexion consists in forcible dilatation, curettage, and packing the uterus with gauze. In rare instances Dudley's operation serves admirably. All other methods of treatment, such as electricity, local massage, stem and other pessaries, are not only inefficient, but many of them dangerous. The technique of the standard operation is as follows:

The patient being anæsthetized and placed in the dorsal gynecological position, the external parts and vagina are thoroughly scrubbed with green soap on brush and gauze, and washed and douched with a solution of bichloride of mercury (1:3000). A posterior vaginal retractor is introduced and the anterior lip of the cervix seized with a bullet forceps. The amount of stenosis and the direction and length of the uterine canal are determined by the uterine sound. The passage of the sound is sometimes a difficult procedure. A most successful manœuvre in passing the sound is to point it backward as if it were going into a retroverted uterus, and push it along until it reaches the obstruction at the internal

os. Then, while making slight pressure, rotate the sound until the tip points toward the front, when it will be found to slip or jump through the internal os. If this does not happen the first time the sound may

FIG. 68

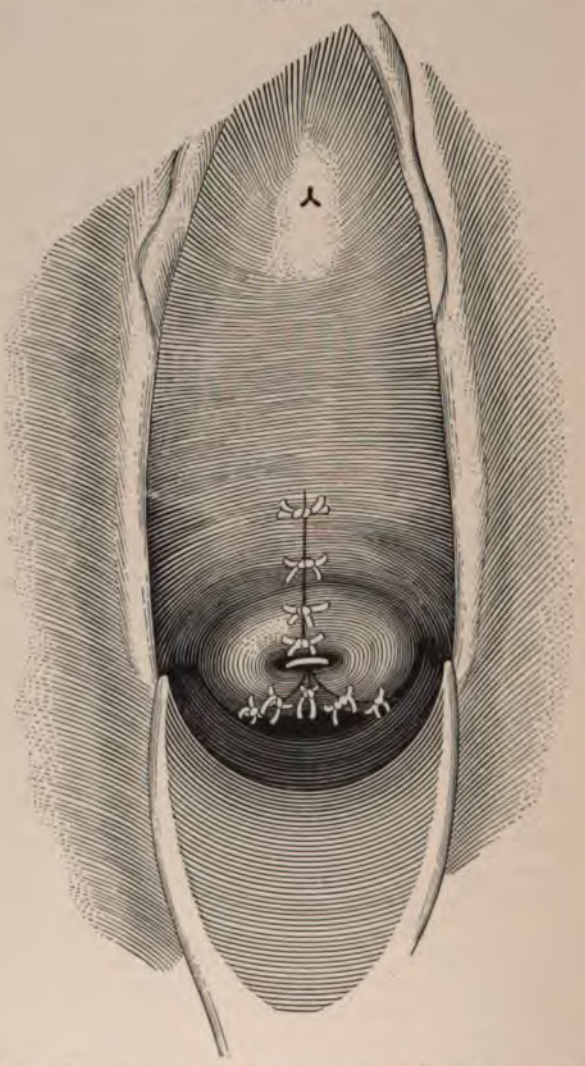


The cut surfaces held apart by tenacula; the dotted lines show wedge-shaped pieces to be removed by scissors, in order to make the cut surfaces more readily fold upon themselves; sutures designed to fold cut surfaces on themselves in place, but not tied. (Dudley.)

be rotated repeatedly, the position of the tip being slightly changed each time. The elongated cervix makes the distance to the fundus surprisingly great, even in an undeveloped uterus. The distance to the internal

os will indicate the point beyond which the dilator must be inserted to dilate the constriction. The Sims dilator is now introduced, the same method being employed as was used in passing the sound. Careful intermittent compression of the handles is made until the canal has

FIG. 69



Sutures tied and operation complete, both on posterior and anterior lips. (Dudley.)

become opened sufficiently to admit the heavier dilator, such as the Ellinger-Goodell or the Wathen. These instruments are provided with thumb-screws, but they should not be used for compressing the handles. The handles should be compressed by the force of the hand, the thumb-

screw being used to hold what has been gained from time to time. The little guard-nut, which prevents the handles from coming together suddenly and thus tearing the cervix wide open, should be carried forward a turn or two, then the handles forced up to it and held there by the thumb-screw. In this way the cervix is dilated safely until sufficient room is given to admit a finger, and the constricting fibres thoroughly paralyzed. The tissue should be stretched and not torn, and it is well to consume at least fifteen minutes in this process.

The dilator is now removed and the interior of the uterus irrigated with bichloride solution (1:3000). The sharp uterine curette is now gently introduced to the fundus and by quick drawing motion a strip of mucous membrane is removed down to the internal os. This process is repeated until the entire endometrium has been scraped away. It is well to begin at some selected point on the anterior or posterior wall and go systematically from right to left or left to right around the entire circumference of the uterus. The cavity is again irrigated with hot saline solution, after which the uterus is packed firmly with iodoform gauze down to the internal os. The cervix should not be packed, but the strand of gauze should be left protruding two or three inches beyond the external os. The vagina is then lightly packed with gauze to continue the drainage and steady the parts. The gauze is left in place for three or four days, when it is all removed and hot boracic acid (1 drachm to 1 pint) continued for a week or ten days. This treatment not only secures drainage but it also stimulates contraction of the uterus, thereby setting up a succession of gymnastics which strengthens its musculature and nutrition. The gauze packing secures this advantage over the stem pessary and is much safer. A week's confinement in bed is usually all that is necessary, the patient gradually resuming her normal vocations.

DUDLEY'S OPERATION FOR ANTEFLEXION.

Dudley's operation consists in incising the cervix along the middle line posteriorly up to the internal os, and then doubling each raw surface upon itself and sewing the wound transversely to the line of incision. The technique is as follows: The cervix is dilated and the uterus curetted. One blade of a pair of scissors is then inserted into the cervical canal and the cervix divided in the middle line posteriorly up to the internal os, the incision extending beyond the utero-vaginal attachment if necessary. The cut surfaces thus incised are then held widely apart by means of two tenacula in the hands of an assistant; the incision is somewhat deepened at and above the internal os by means of a scalpel, a small wedge-shaped mass is then cut out of the cervix, at either side of the original incision, and at about the middle point, extending transversely to it. The cut surface on either side is now folded upon itself by a single silkworm-gut suture, as shown in Fig. 68. This suture is tied and fortified by interrupted sutures on either side. Each cut surface is thus folded upon itself, from before back-

ward, and the os externum is carried directly back to the upper angle of the primary incision. This restores the normal direction of the cervix.

In many of these cases there is a disproportionately long pointing anterior lip. It is well in these cases to remove this elongation, closing the wound by a simple suture (Fig. 69). Dudley does not recommend this operation upon the small infantile uterus, and only finds it applicable to selected cases of acquired anteflexion. He gives the warning also that it is not presented as a panacea for all the maladies of pelvic origin in which there happens to be a pathological anteflexion. The operation is not a substitute for dilatation and curettage, but rather supplementary to those two procedures. In cases subjected to dilatation and curettage it may be necessary, in rare instances, to repeat the operations, but it is a safe, conservative, and generally satisfactory procedure.

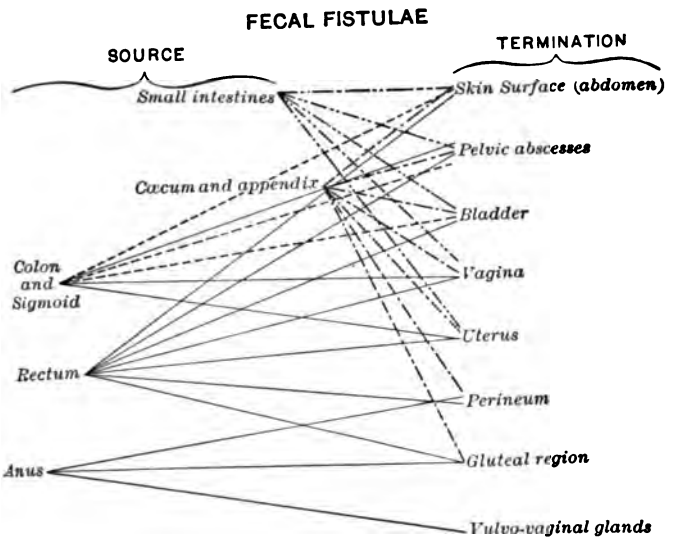
CHAPTER V.

FECAL FISTULÆ CONNECTING WITH THE FEMALE GENERATIVE ORGANS.

By GEORGE H. NOBLE, M.D.

Definition.—A fecal fistula is an unnatural passage from some part of the intestinal canal to the cutaneous surface or into another organ. Through such passage portions of the intestinal contents escape[1] (Fig. 70). These fistulæ may be straight and short, with or without

FIG. 70



an epithelial lining, or they may be tortuous, and at various points dilated into pockets or pus cavities. They usually derive their names from the portions of the intestinal canal from which they arise and the parts into or upon which they empty; for instance, a fistula connecting the anus with the skin is an anal fistula; one connecting the rectum and vagina is a rectovaginal, or the rectum and bladder, a rectovesical fistula.

Fistulæ involving the intestinal canal above the rectum are commonly called intestinal; for instance, intestinovaginal, intestinovesical, etc.

[1] This definition, for the sake of convenience, purposely ignores the fact that the intestinal contents do not properly assume the name of feces until they have passed the ileocolic valve.

The nomenclature of such fistulæ does not necessarily indicate what part of the intestine is involved.

Etiology.—Fecal fistulæ result from traumatisms or inflammatory processes, falls upon sharp instruments, puncture, and gunshot wounds. Surgical operations and lacerations during childbirth are the most common traumatic causes. The latter are responsible for a very large percentage of cases. Foreign bodies are infrequent causes. The rectum has shown a remarkable degree of toleration for them; for instance, a fork has remained in the rectum for years, a sliver of wood for six months, calcareous masses for months and even years, and many other foreign articles have given no special trouble and caused no ulceration for a long period of time. It is hard to reconcile such occurrences with the supposed baneful influences of less irritating substances; so of late years more attention has been given to the study of infection as an etiological factor, especially since it has been shown that pus-producing bacteria are not uncommon causes. Abscesses evacuating into both rectum and vagina are followed by fecal fistula after the sinuses have cicatrized and become lined with epithelium. Suppuration of dermoid tumors and encysted ectopic pregnancies may discharge thus in both directions.[1] Abscesses of the vaginal walls and of the vulvovaginal glands, appendicular abscesses, typhoid perforations, and suppurating cysts of Gärtner's duct may also be included in the list.

Another form of the inflammatory type is due to stricture of the rectum, especially in syphilitic subjects. The ulceration at the upper margin of the stricture extends in the direction of least resistance, and if the stricture becomes very tight the tendency to formation of fistula is increased. The alvine dejections find great difficulty in passing *per viam naturalem*, intraintestinal pressure is augmented, and stagnation, fermentation, and decomposition of intestinal contents are pronounced; a congenial culture medium for the ever-present colon bacillus is thus accumulated, mixed infection is invited, and a common result is ulceration through the rectal wall in one or more places, or the full flow of feces may be emptied into the vagina through a single large opening.

Tubercle bacilli not infrequently produce fistulæ in ano, but rarely cause them in other parts of the intestine. Primary tuberculosis does not often attack the rectum, and rarely invades the vagina, yet the ingestion of tuberculous sputum furnishes a means of infection of abrasions in the rectum, independent of systemic influences. The gastric juice does not destroy, though it may retard, the development of the bacilli of tuberculosis; on the other hand, the alkaline intestinal fluids rather favor their growth. Thus it is not improbable that these germs do reach the rectum by means of sputum swallowed by the patient. In fact, they have been found in feces of tuberculous subjects when no intestinal lesions of a tuberculous character were present.

[1] Pozzi, vol. ii. p. 339.

(Von Jaksch, also Simmons, *Münchener Med.*, March, 1900, p. 317, Tuttle.)

Cancer is not to be considered in the etiology of the disease, as fistulæ from malignant ulcerations do not last long enough to become chronic. The early death of the patient is inevitable.

Symptoms.—The most characteristic and constant symptom of fecal fistulæ is the passage of fecal matter and gas through the tracts. Bits of undigested food, fibres of meat, small seed, and other intestinal materials may be found escaping from an external fistulous opening.

If a fistula opens externally, excoriation of the surfaces involved, together with general distress and offensiveness, usually acquaint the patient with the condition before medical advice is sought.

Below as different fistulæ are considered, attention will be given to their individual symptoms.

Anovulvar Fistulæ connect the anus with the vulva external to the hymen. In addition to the causes mentioned under the head of etiology of fecal fistulæ this form of fistula may have its origin in injury or infection of the hair follicles or other glands about the introitus.

Diagnosis.—Such patients often give a history of abscess of a vulvovaginal gland, the symptoms of which suddenly subside as a result of evacuation into the rectum or anus. This is followed by colon bacilli infection, and a renewed inflammation and swelling of the gland and discharge of its contents on the surface of the labium, either spontaneously or by the knife. The sore and sensitive induration often feeling like a ridge or cord beneath the skin and extending back to the anus remains. Feces may escape through the external opening during or immediately after defecation. The tracts are not usually very tortuous and do not often form deep-seated pus pockets; the parts from which they take their origin are situated external to several layers of dense fascia, consequently they rarely penetrate the ischiorectal fossa, but burrow directly backward behind the superficial fascia to the rectum or anus. They may be single or multiple with as many openings at the external extremity. If the vulvar opening is single it is nearly always situated close to the hymen. Gas escapes less frequently through this form of fistula than through those connected with the rectum or intestines.

Treatment.—The treatment of anovulvar fistulæ is the same as for anal fistulæ. It is mainly surgical; temporizing with injections, caustics, etc., commonly gives way to surgical means even after persistent trials. Occasionally a case is cured by such means, but it is at the expense of much time and suffering, whereas a simple operation will effect a cure.

A probe should be passed through the fistula from the vulvar opening, and if it can be easily traced with the finger, showing a superficial course of the tract, it may be safely laid open with a bistoury; but if the probe can be passed deeply into the perineum, showing that the triangular ligament or the so-called body of the perineum is implicated, the fistula should be dissected out of its bed and the parts brought

together with silkworm-gut sutures. These sutures should be inserted as in perineorrhaphy, each taking a deep hold and including an abundance of tissue. If the tract enters the rectum above the internal sphincter—which, indeed, must be rare, as the writer has seen but one case, and has been unable to find any on record—it must be treated on the principles advised for the cure of rectovaginal fistulæ. When the fistula is double, very tortuous, or has multiple openings, or is connected with deep pus pockets, it is best to lay open all the sinuses, curette with a sharp instrument, and treat antiseptically with daily gauze packing. If the surface is not too extensive curetting may be followed by the application of carbolic acid and alcohol, with a view of thoroughly sterilizing the parts. If the perineum sustains much injury from deep cutting a second operation will be necessary for its repair. Careless splitting of fistulous tracts in this region should be guarded against, and if the sphincter ani muscle requires cutting it should be severed perpendicularly to the course of its fibres, and not in a slanting direction (Tuttle).

Rectovaginal Fistulæ. Etiology.—This is the most common of all serious fecal fistulæ on account of the close relation of vagina and rectum, and the numerous injuries to which the rectovaginal septum is subject. Kelsey says the most frequent cause is laceration during childbirth, followed by imperfect closure or partial cicatrization, consequently this form of fistula is mainly found in the lower half of the vagina. Lacerations extending to the rectum, but not implicating the mucous membrane, may, from prolonged pressure of the fetal head, become complete by subsequent sloughing (Tuttle).

Next to laceration, syphilitic stricture of the rectum causes more rectovaginal fistulæ than any other one thing. The ulcerative process on the upper side of the stricture may penetrate the septum in a straight, oblique, or tortuous course and open into the vagina at a point near the level of the stricture, or may burrow quite a distance down the septum before entering the vagina even as far as the posterior commissure.

Foreign bodies in the vagina are rarely responsible for the occurrence of the lesion. Pessaries have been accredited with producing them, but such instances are extremely infrequent. Foreign bodies in the rectum constitute a more common cause, but only a small percentage of cases can be attributed to them. With the exception then of laceration during parturition it is seen that the causes of these fistulæ originate most frequently outside the vagina, and most of these have their beginning in the rectum.

Symptoms.—The chief symptoms are passage of fecal matter and gas through the vagina and excoriation of the mucous membrane of vagina and vulva. If the opening is large there may be a constant stream of feces escaping between the labia, especially if the stools are liquid in character; but in case of small fistulæ fecal matter collects more or less slowly in the tract and is expelled at intervals under the influence of sudden movements or straining. The consistence

of the feces naturally has much to do with the amount and time of discharge.

Diagnosis.—Rectovaginal fistulæ are easily detected on account of the escape of fecal matter and gas, and excoriation of the vaginal mucosa. Feces may be found between the labia unless the fistula is small or situated low down. In the latter case, when the condition is due to unrepaired or partially cicatrized tears of the rectovaginal septum, the patient may keep the parts fairly clean if the rectal opening is below the internal sphincter. If the tract is long and narrow and extends up the rectovaginal septum several inches, and if it terminates above a stricture of the rectum, pus is more frequently discharged into the vagina than feces. In such instances either the perineum is intact or there is no evident connection between the tear and the fistula relative to the cause. Quantities of pus frequently collect in the vagina, indurated nodules will mark the course of the tracts, and hard masses may be found at the seat of the stricture in the rectum. Such a condition may easily be mistaken for malignancy. If the patient is placed in the knee-chest position and the vagina exposed through Sims speculum its upper portion may be found free from pus. In these circumstances the vaginal end of the fistula will be found near the introitus. If pus covers the vault of the vagina while its lower end is clean the fistula is more direct in its course, and the vaginal opening will probably be found near the cervix uteri. If fecal matter is present in the vagina the fistulous opening will be too large to escape detection; the excoriated area will at once attract attention. In such cases ocular inspection is rarely necessary to make a diagnosis, as the examining finger will detect the indurated edges and the opening they surround.

The diagnosis may be further verified by injecting colored fluids into the rectum while holding the vagina open with a speculum. If the fistula connects with the rectum the fluid will return by the vagina. If a probe is inserted through the vagina into a fistula a finger in the rectum will easily come in contact with it. If the instrument cannot be brought in contact with the finger the communication must be above the rectum, that is, there is an intestinovaginal fistula.

Treatment. *Medical.*—The two great principles in the treatment of fistulæ in general hold good in this instance; first, stop the entrance of infecting material into the tract; second, provide for ample drainage through the other end of the canal. If these two objects can be accomplished fistulæ will heal readily, excepting those infected with tuberculosis.

The great difficulty in medical treatment is that the first principle above mentioned cannot be satisfactorily carried out without surgical aid. Exceptionally an opening may be so small that cauterization may close the proximal or intestinal end sufficiently to prevent entrance of infectious matter; then if the tract drains free enough it may heal by granulation.

Small rectovaginal fistulæ produced by trauma sometimes heal spontaneously just as rectoabdominal fistulæ do. But not so if the

septum is very thin and the opening large, for the epithelium of vagina and rectum unite over the margin of the wound before granulating tissue can possibly fill the aperture. When fistulæ occur after hysterectomy with free excision of the upper extremity of the vagina, leaving an extensive surface to granulate, spontaneous cure is more apt to take place than in other circumstances.

Topical applications, though of doubtful value, may sometimes be useful, but tuberculous fistulæ and those due to stricture of the rectum necessarily require surgical treatment.

Medical treatment consists in constipating the bowels for three or four days to a week at a time by the use of opium. The fistula may be cauterized[1] and daily antiseptic irrigation of the rectum and vagina practised. Boracic acid is safe and as effectual as any; a weak solution of carbolic acid and nitrate of silver may be injected through the sinus.

When the bowels are acting each evacuation should be followed by an injection of salt solution for the purpose of cleansing away feces and mucus and washing out the fistulous tract. The opening may be cauterized with nitrate of silver and later exuberant granulations stimulated with light applications of 5 per cent. solution when necessary.

Anyone undertaking the medical treatment should be cautious in making promise of cure by such measures, for failure in the vast majority of instances will be the reward.

Surgical.—The great difficulty in the way of surgical treatment is infection. It exists in the wound before the operation is done and is prone to re-enter from the rectal side to such an extent that fecal fistulæ have in past years been regarded as extremely difficult to cure. To prevent percolation of fecal matter and infection from the rectal side of the wound is the prime object to be obtained in any procedure, and for this purpose many modifications of the older operations have been made until now the technique seems very nearly perfect. Formerly fistulæ were attacked from three different points—the vagina, the rectum, and the perineum. On account of the difficulty, however, of sterilizing the rectum and keeping it sterile, together with the limited space the rectum affords for manipulating surgical instruments, operations from the rectal side have been practically abandoned.

Operations through the vagina were formerly done after the simple method employed by Sims in this country and by Simon in Germany in the treatment of vesicovaginal fistulæ; that is, by paring off the edges of the opening and inserting deeply the old silver suture, embracing a large amount of tissue but not penetrating the rectal mucosa. In small fistulæ this method gives fairly good results, but large ones are so frequently distorted by cicatricial bands that the surrounding parts are subjected to such tension when the wires are twisted together that the sutures cut and invite infection and failure.

Emmet,[2] in a case with a large opening, complicated with contrac-

[1] A. Lapthorn Smith applies the caustic in small fistulæ about the fourchette by wrapping a thin layer of absorbent cotton around a flexible probe, wetting the cotton, rubbing over its surface a stick of fused nitrate of silver, and passing the probe through the fistulous tract.

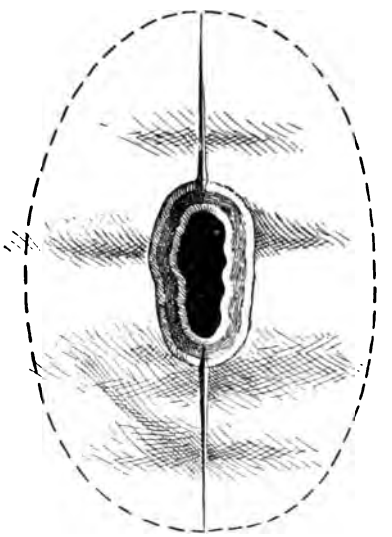
[2] Emmet's Gynecology, 1884-1885.

tion of the vagina by cicatrization, dissected the rectum from the vagina by the flap-splitting method, and after suturing the rectal flap left the vaginal side to close by granulation.

Unfinished operations in this region are not usually admissible in the present advanced stage of autoplasty, as the vaginal wall is very pliable when liberated from unnatural adhesions, but marked contraction of the vagina and extensive deposits of scar tissue occasionally force the surgeon to abandon ideal operations and adopt less perfect methods in extreme cases.

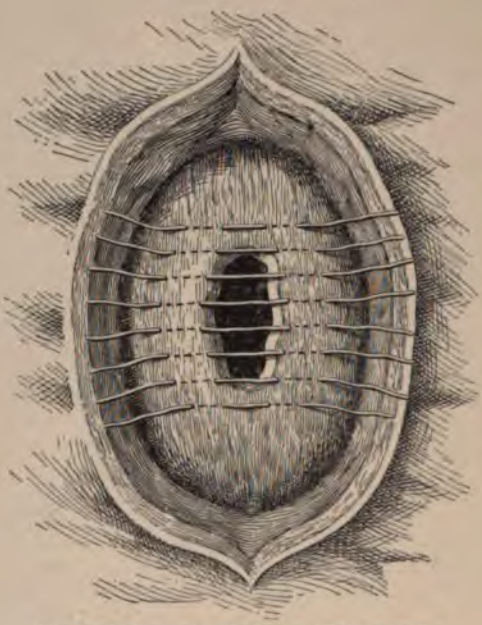
Operation for Small and Medium-sized Fistulæ in Middle and Upper Third of Vagina. LAUENSTEIN OPERATION.—Lauenstein applied the flap-splitting operation to this class of fistulæ, making a distinct advance in the surgical treatment. The easiest way to do this operation is to make two vertical incisions, one above the other below the fistula, cutting through the vaginal wall to the interspace between it and the rectum (Fig. 71). These incisions should be about half an inch in length in case of small fistulæ, but longer if ample working space is not secured. Then they are connected by a semicircular incision around each side of the fistula, after which the edges of the aperture are thoroughly denuded. The vaginal flap is dissected from the rectum by splitting the septum for half an inch or more all around the fistula. The wound in the posterior wall of the vagina then is made much larger and elliptic in shape, while the rectal wall is untouched, except for the slight enlargement of the opening done in paring its edges. Lembert sutures of catgut (the writer prefers No. 2) are passed from side to side through the muscular coat of the rectum without penetrating the rectal mucosa and tied (Fig. 72). (Tuttle, p. 452.) The vaginal flap is then closed over these sutures by passing silkworm-gut sutures through its entire thickness, but not penetrating the rectum (Fig. 73). The catgut sutures are in this way completely buried. One end of each silkworm suture should be cut short and the other tied together in a small bundle and protected by lightly filling the vagina with antiseptic gauze (iodoform, boracic acid, etc.). The gauze should be removed in forty-eight hours and the vagina douched antiseptically. Afterward the douching should be done daily. On the seventh day the sutures should be inspected, and if cutting or loose in the stitch wound they should be removed, otherwise they may remain a few days longer.

FIG. 71



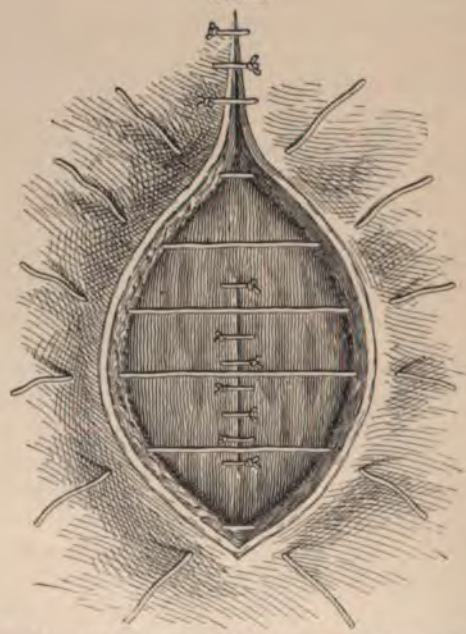
Incision in Lauenstein's operation for recto-vaginal fistula.

FIG. 72



Sutures closing rectum in Lauenstein's operation.

FIG. 73



Rectovaginal fistula. Lauenstein's operation (Montgomery). The rectal margin is closed with buried catgut, knots tied in the wound. The vaginal margin is then closed from side to side with silkworm-gut.

McMurtry extols the operation in a paper read before the Southern Surgical and Gynecological Association in New Orleans, giving credit for the principle to Tait, for it is the application to rectovaginal fistulæ of the flap-splitting idea popularized by this distinguished surgeon.

FERGUSON'S OPERATION.—Ferguson modified the old operation by trimming a cuff away from the vaginal side, making a circular incision about half an inch around the vaginal opening and inverting it into the rectum. It is best explained in his own words: "A circumferential flap is made from the vaginal surface; the incision extends to but not through the mucous membrane of the rectum (Fig. 74). The edge of the flap is now seized with four pressure forceps, inverted into the rectum, and a small pile clamp applied. Instead of the clamp a stout ligature may be thrown around the tissues inverted into the rectum, or buried inversion sutures of catgut may be used (Fig. 75).

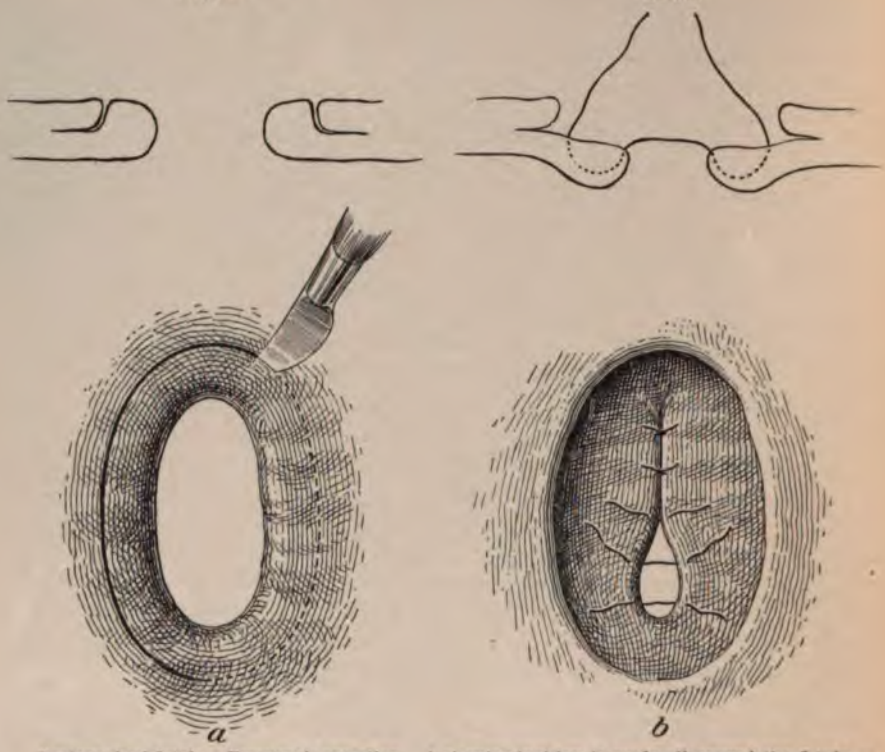
The free portion of the flap external to the clamp is burned off with the actual cautery, but the clamp is not removed until interrupted sutures of silkworm-gut have been inserted in the usual way, without grasping the rectal mucous membrane, and tied on the vaginal surface (Fig. 76). A rectal tube well wrapped with iodoform gauze is placed in the rectum, and the vagina is packed with iodoform gauze. In this manner an extensive denuded surface is secured which rapidly unites upon proper coaptation. The rectal flap is cauterized, thus lessening the liability to septic infection from that source. The rectal tube and vaginal packing further guard the wound against infection, and act as a splint to ensure that rest so necessary to primary repair.[1]

Operation for Large Fistulæ.—Before operating for large fistulæ it is important to note the effect closure of the wound will have upon the lumen of the rectum. When there has been extensive destruction of tissue, closure may constrict it to an annoying if not a serious degree. The edges should be held together with tenacula and the finger passed into the rectum previous to beginning the operation for the purpose of determining its patency. If the bowel is much contracted the wound should be drawn together in a line transverse to the axis of the rectum. If there is still too much encroachment upon the calibre of the bowel, the simple operation or even the Lauenstein is not applicable, but either a modification of Ferguson's or the Dudley-Segond operation may be performed.

MODIFICATION OF FERGUSON'S OPERATION.—The writer has found that very extensive openings may be closed by turning into the rectum broad flaps of vaginal mucous membrane. This is best executed by modifying Ferguson's operation so as to make, in place of a cuff, a very wide flap. It should be much wider laterally than anteroposteriorly, as it is the lateral portion that compensates for the loss of rectal tissue. I have extended the incision out on the side walls of the vagina, making the lateral portions of the flap nearly an inch wide, when in the opposite direction they were not more than half an inch broad. As these flaps must have sustenance, the incision must not extend

[1] American Journal of Obstetrics, 1895, p. 476.

FIG. 74 FIG. 75



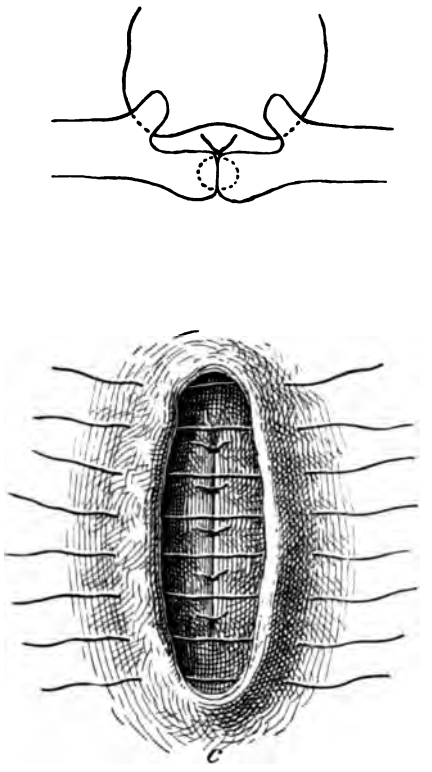
Rectovaginal fistula. Ferguson's operation. A circular incision is made all around the fistula, cutting through the vaginal to the rectal wall, forming a cuff-like rim to the rectal margin of the fistula, which is inverted into the rectum and secured with buried sutures. The vaginal margin is then closed in median line with silkworm-gut. (American Journal of Obstetrics, April, 1895, p. 481.)

deeper than the thickness of the vaginal walls, and not into the muscular coat of the rectum. In dissecting them off the operator must not cut back too close to the margin of the fistulous opening, lest they may be made too thin at this point, and sloughing from deficient blood supply ensue. The edges of the flap are turned into the rectum and stitched with Lembert sutures, as in the Lauenstein operation. Then to compensate for loss of tissue in the vagina the second row of sutures (silkworm-gut) is introduced so as to close the wound transversely.

This is a tedious operation and may fail if not aseptically done, if the surfaces are not perfectly approximated, and if the blood supply to the flap is not maintained. However, it is not a serious procedure and does not jeopardize the patient's life half so much as the ideal Dudley-Segond operation.

DUDLEY-SEGOND OPERATION.—The Dudley-Segond operation is applicable to large fistulæ in the upper half of the vagina. The technique is as follows: The patient being prepared, anæsthetized, and placed in the dorsosacral position, the following are the successive details of the operation (Figs. 77 and 78).

FIG. 76



Rectovaginal fistula. Ferguson's operation.

1. *Dilatation of the anus.* This should be digital, slow and graduated —cadenced, to use an old expression of Recamier's—and as complete as possible. In proceeding thus the mucous membrane is not broken beneath the touch, easy access is obtained, and finally the sphincter always recovers the integrity of its functions.

2. *Separation by dissection of the intra-anal mucous membrane.* The circular incision of the anal mucous membrane should be made at about 2 or 3 cm. above its connection with the skin. This precaution is indispensable in order that the ulterior suture may be well hidden in the anal depression. The mucous membrane having been cut in a circular form, nothing is easier than to dissect it from the top of the sphincter by little clips of the scissors. This done, the sphincter fully revealed is held in position by two dilators, enabling one to grasp the entire thickness of the rectal walls, and proceed as follows.

3. *Division of the rectovaginal wall with mobilization, and drawing down the section of the rectal segment beneath the fistula.* The division of the wall should be made with the finger and extend to the fistula without the employment of any sharp instrument whatever. The

surface of the fistula is then cut with a bistoury, thus dividing it into two independent orifices, one vaginal the other rectal (Fig. 77). Then grasping with the fingers the anterior rectal wall below its orifice, putting all instruments aside, continue the rectovaginal dissection, combining it with traction until that part of the lower rectum corresponding to the upper edge of the rectal orifice of the fistula is drawn down far enough to admit of its being sutured to the mucous rim that forms the edges of the anus (Fig. 78). To facilitate the mobilization and separation a museau forceps previously passed into the vagina holds the uterus firmly. The drawing down of the rectum is performed by successive tractions, and the perirectal loosening is effected by means of

FIG. 77

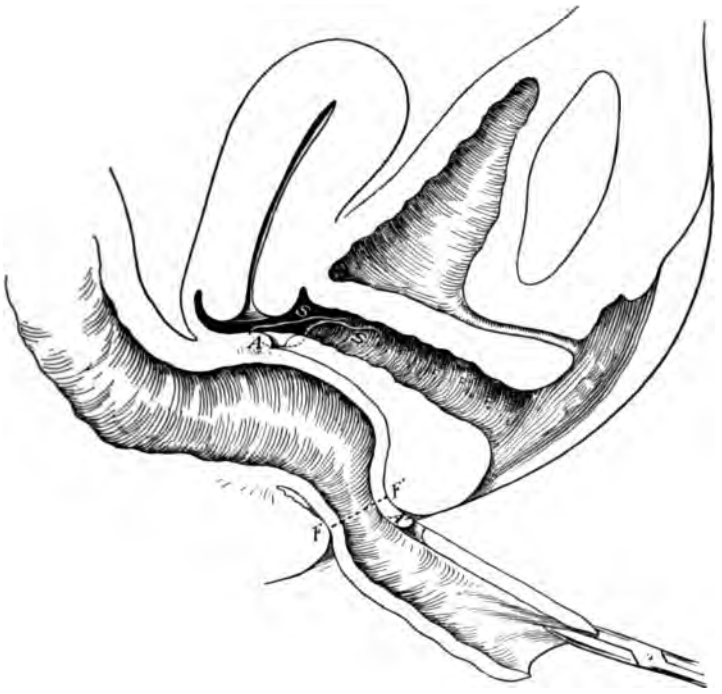
Rectovaginal fistula. Dudley's operation. The rectum is dissected free by an extensive Whitehead operation, following the dotted lines *C*, *A*, *B*, and *E*.

the thumb-nail. My observation shows me that this method is possible, no matter how elevated the fistula may be, and that the thick peritoneum in Douglas' cavity may be pushed aside without danger of breaking. In proportion as the lowering of the anterior rectal wall is accomplished the lateral and posterior of the rectal cylinder will corrugate and project. No attention should be paid to this in the beginning, but when the anterior rectal wall is drawn down to the proper degree the rectal cylinder should be freed on the sides, then behind, so that it cannot corrugate and only the best conditions ensue after the resection of the rectal segment below the fistula. If I make myself clearly understood,

it is evident that this resection must be performed obliquely from top to bottom and from front to back, transversing one way the upper edge of the rectal orifice of the fistula, and on the other above the upper posterior edge of the sphincter at a distance varying, of course, with the position of the fistula.

4. *Suturing of the rectum to the anus.* This suture is made with floss silk according to the usual rules. Although the rectovaginal division was not extensive, I judged it prudent to insert a small drain which for a few days would receive any liquid that might ooze out.

FIG. 78



Rectovaginal fistula. Dudley's operation. The rectum is drawn down until the rectal side of the fistula *A'* is outside of the anus. The rectum is cut off above the opening *A'* and stitched to the anus at *F-P*. The vaginal side of the fistula *A* is paired and closed with sutures tied in the vagina.

5. *Suture after freshening the edges of the vaginal orifice of the fistula.* This suture is made through the vaginal passage. It could have been omitted, inasmuch as the rectal communication no longer existed, having disappeared with the preceding operation, leaving the rectal shade drawn before the vaginal window. It is, however, advisable to close the vaginal orifice with a few catgut stitches in order that the utero-vaginal secretions may not gain access to the wound resulting from the rectovaginal division.[1]

[1] Trans. Sect. Obstetrics, A. M. A., 1902, p. 69.

Fistulæ in Lower Third of the Vagina.—Fistulæ near the perineum are often difficult to cure by simple methods on account of the action of the levator ani and other pelvic muscles which add motion to the ordinary peristalsis of the bowels. If the lesion is very low down the old operation of simple denudation and suture fails on account of imperfect denudation and approximation of the walls of the tract, owing to thickness of the septum.

Saucerotte[1] first split the perineum open, cutting into the fistula, converting it into a complete lesion of the perineum. The remains of the fistulous tract is then excised and the operation completed as in perineorrhaphy. The results have been so satisfactory that this plan has been extensively employed, the Emmet and Tait operations for perineorrhaphy being more frequently employed than others.

The advantages of this operation are appreciated when once tried. It not only secures wide coaptation of surface but increases working space so that it is changed from a tedious procedure to one requiring but little skill or dexterity.

There can be no objection to this method when the fistula is due to laceration and imperfect repair of the perineum, for perineorrhaphy is a necessity in such cases, and it is but a short step further to trim out the fistula. The method has much to recommend it.

Operations for complete lacerations of the perineum are not always successful, consequently a number of operations and modifications of existing methods have been devised. The safest of these, in the experience of the writer, is the flap-splitting operation coupled with dissection of the anterior wall of the rectum free from the vagina, and drawing it through and external to the anus, thus making between the vagina and rectum an unbroken septum, which cuts out liability to infection from the rectum. The technique is described in Noble's operation for complete laceration of the perineum. I have done quite a number of these operations on the perineum and find it is eminently applicable to rectovaginal fistula in the lower half of the vagina.

Rectovaginal fistulæ with stricture of the rectum should be regarded as a complication of the stricture and not the principal factor, because such fistulæ cannot be cured without relieving the stricture, and in operating for the latter we cure the former.

The physical condition of the patient, and the character and location of the stricture are the main points influencing the methods to be employed in operation.

When low blood counts or other physical conditions make radical operations hazardous, less dangerous methods should be used, even though they may not be as promising in results.

Temporary operations, such as splitting of the stricture and fistulous tract, and curetting of lacerating surfaces to drain the rectum above the stricture and favor granulation and healing of diseased surfaces, often enable weak and anæmic subjects to recover sufficiently

[1] Pozzi, vol. ii. p. 373.

to undergo radical operations, especially when the patient is properly nourished and treated for existing constitutional diseases.

When there is a large amount of inflammatory exudate extending from the ulcerating surface above the stricture into the broad ligaments and under the peritoneum posteriorly the Murphy operation is very difficult to perform. In such conditions preparatory treatment contributes success to major operations.

Radical operations vary from fairly simple technique to capital operations, according to the location of the fistula and character of complications. Simple non-ulcerating stricture, near the anus, due to impaction of the fetal head or other obstetrical injuries, and subsequent cicatrization, may be relieved by modified Whitehead operation and closure of the fistula on the vaginal side. This form, however, is rarely seen, consequently more extensive operations are usually required. Resection of the rectum is indicated in most cases of stricture in this region, especially in syphilitic subjects.

When the disease is located in the upper end of the rectum, extirpation is commonly required, few cases being sufficiently limited to admit resection.

Having decided one of these measures must be employed, it is likely no operation will be necessary in the vagina, for the re-establishment of a healthy rectal canal diverts the flow of the feces from the fistula and removes the obstacles to spontaneous recovery. If a Kraske or other posterior incision is employed for the resection of the rectum, the vagina is left uninjured; therefore, denudation and suturing of the vaginal edges of the fistula fulfil the requirements.

If a Murphy extirpation is practised the vaginal wall is split open posteriorly through the perineum and the vaginal end of the fistula excised so that nothing further than the ordinary technique of this operation for extirpation of the rectum is needed; suturing the incision in the posterior vaginal wall closes the vaginal side perfectly.

As the Kraske operation is a hazardous procedure in weak, anæmic subjects, resection through the vagina is preferable. There is less traumatism and shock. The operation is done by splitting the posterior wall of the vagina and dissecting out the rectum with the finger from its attachments in order that the severed ends may be approximated. This may be done without entering the peritoneal cavity. The objection offered to this operation is the limited working space in the vagina, but this may be increased by cutting the perineum back to the anus or by an incision passing by the side of the rectum to the region of the coccyx.

MURPHY OPERATION.—Murphy has modified this operation by extending it much higher, opening the peritoneal cavity, bringing down the sigmoid flexure and stitching it to the anus. As the chief difference between the two operations consists more in the extent to which they are carried than anything else, the one being a resection (extraperitoneal) and the other an extirpation partially (intraperitoneal), the technique of the Murphy operation will serve for both. This opera-

tion was designed for malignant diseases of the rectum, but I have applied it to cases of advanced syphilitic stricture with fecal fistulæ. He describes his operation as follows:[1]

"The vagina was dilated with broad specula, the cervix drawn, and the cul-de-sac opened by a transverse incision similar to that used in vaginal hysterectomy. (See Plate VI.) Large laparotomy sponges were passed into the peritoneal cavity to displace the intestines out of the field of operation. The rectovaginal septum was now divided down to the rectum by a vertical incision in the middle line, extending from the postcervical opening and including the sphincter ani. (See Plate VII.) The hemorrhage, which was quite profuse from the dilated veins, was controlled by compresses and forceps.

"The posterior vaginal wall was now dissected laterally from its attachments to the rectum; lateral and anterior retractors were placed in position and a large field for operation exposed. (See Plate VIII.) The sigmoid could be handled throughout its entire extent and brought well down without the slightest difficulty.

"With scissors the anterior rectal wall, including the sphincter, was divided up to the lower border of the tumor, and the anal segment of the rectum separated from that just above it by a complete transverse incision one inch below the lower limit of the tumor, the incision extending into the postrectal connective tissue. (See Plate IX.) The proximal end of the rectum was grasped with vulsellum forceps, closing it completely, and, by the use of curved scissors separated from its coccygeal and postrectal attachments, upward to the promontory of the sacrum, thus freeing and mobilizing it. The hemorrhage during this part of the operation was easily controlled.

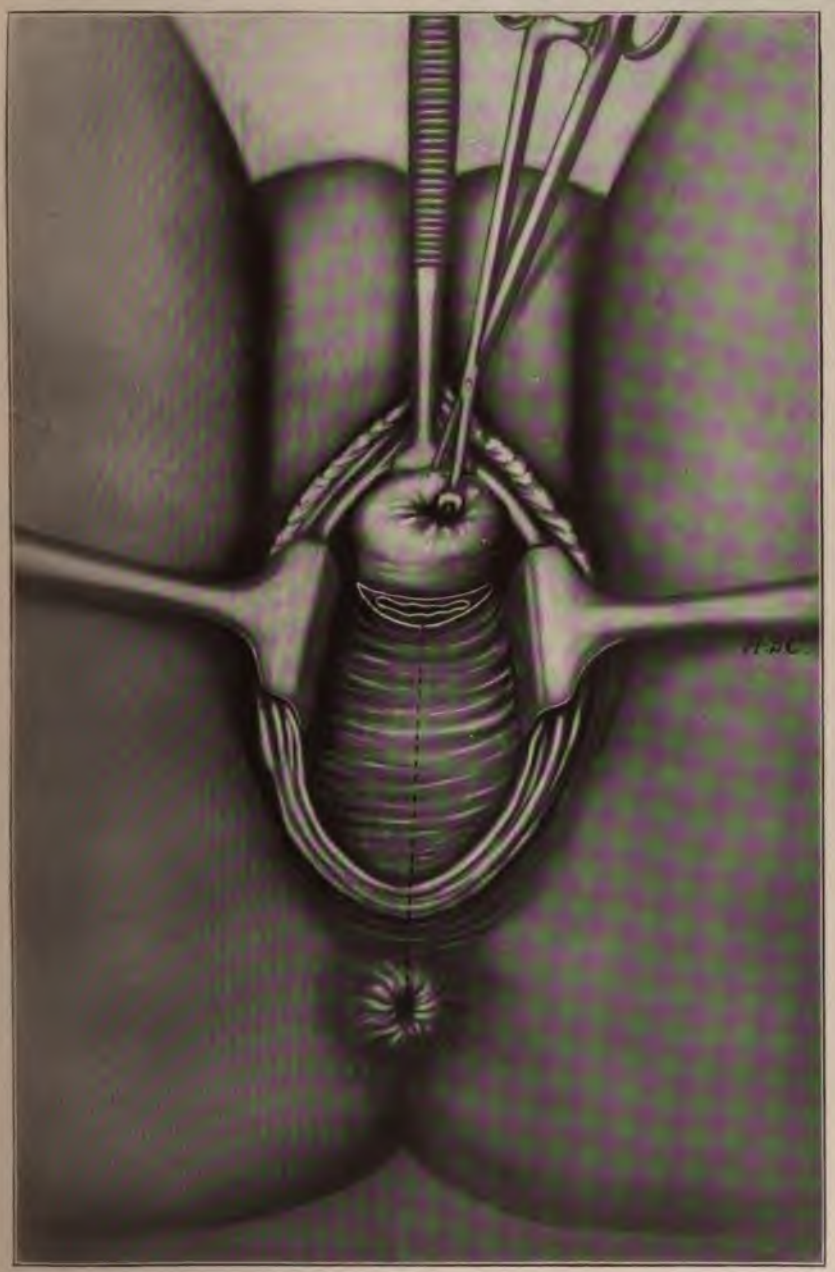
"The mesosigmoid was now loosened sufficiently to allow the healthy portion of the bowel to come well down. The rectum was amputated above the upper border of the tumor growth, and the sigmoid and sphincteric segment of the rectum united end to end by silk sutures. (See Plate X.) These sutures were passed from within outward, thereby causing all the knots to be on the inside of the bowel; the ends were left long to facilitate removal.

"The laparotomy sponges were removed from the peritoneal cavity and the peritoneum on the floor of the pelvis closed with continuous catgut suture. The vaginal wall was sutured to the cervix, closing the transverse incision and the edges of the vertical cut united in the central raphé with silkworm-gut sutures. (See Plate XI.) A large rubber drainage tube one inch in diameter was inserted into the rectum and sutured in place."

This is a capital operation and should not be lightly regarded. The dangers are peritonitis, hemorrhage, especially in malignant cases, laceration or perforation of the gut by unskilful hands, injury to the ureters by extension of the dissection too far laterally, and injury to the superior hemorrhoidal artery before the gut comes down enough to facilitate ligation of that vessel.

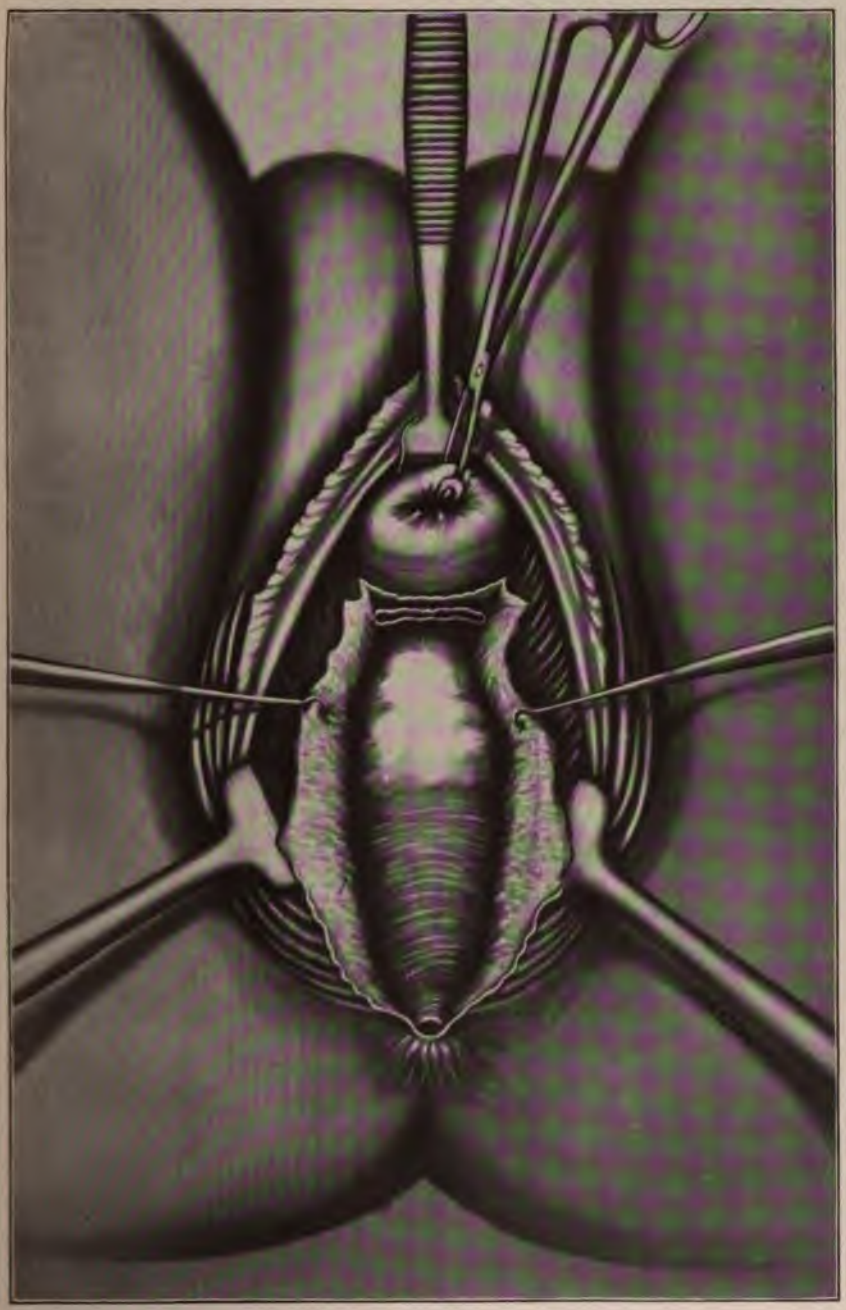
[1] Trans. Southern Surgical and Gynecological Association, 1900, p. 355.

PLATE VI.



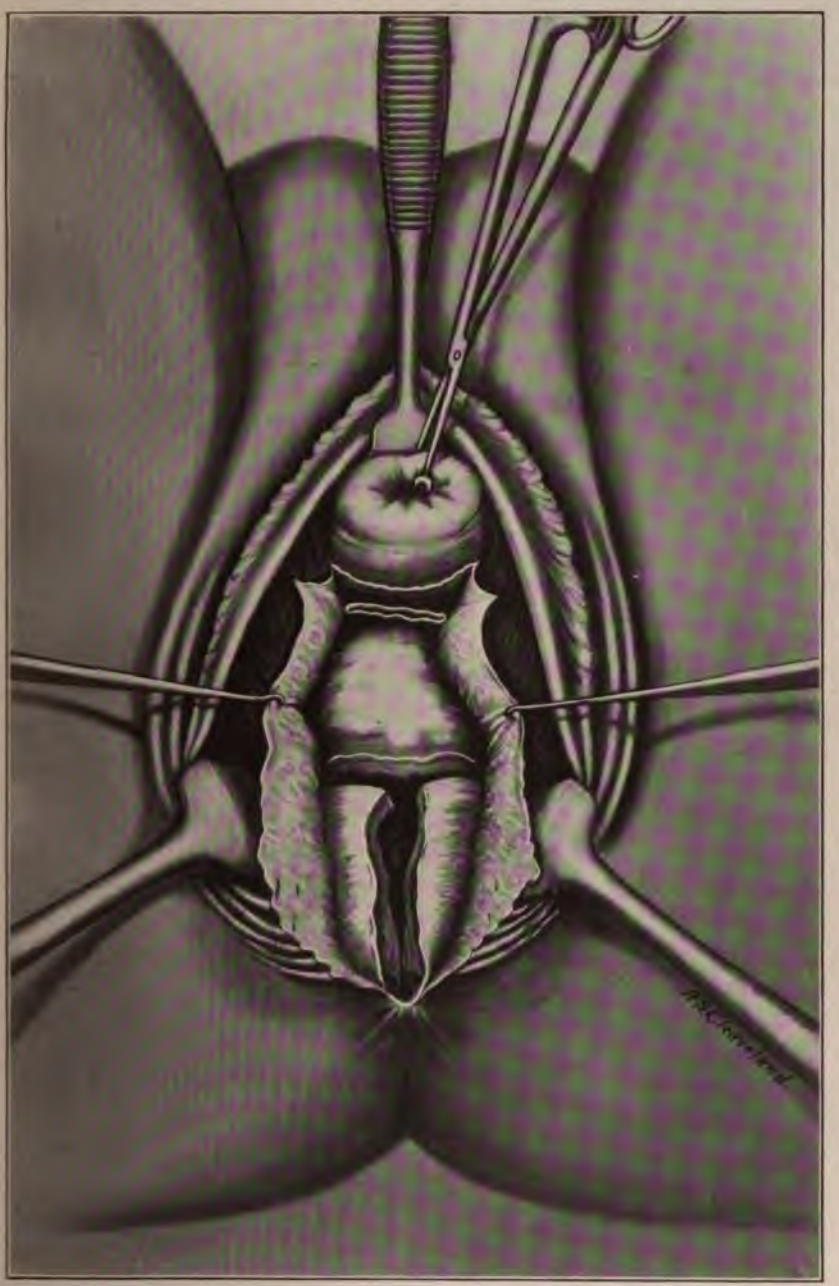
Douglas' pouch is opened through transverse incision behind the cervix.

PLATE VII.



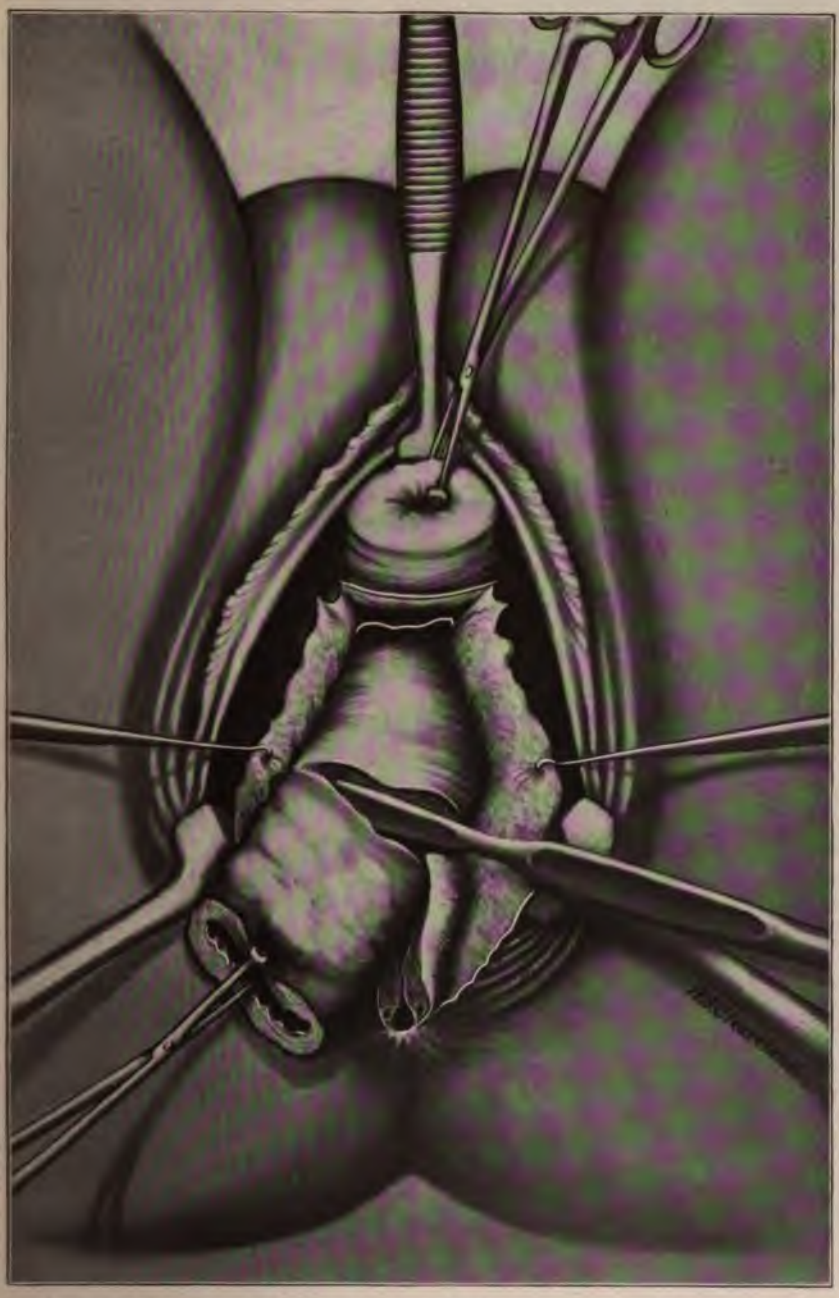
Rectovaginal septum was now divided down to rectum by vertical incision in the middle line, extending from postcervical opening and including sphincter ani. The posterior vaginal wall was now dissected laterally from its attachments.

PLATE VIII.



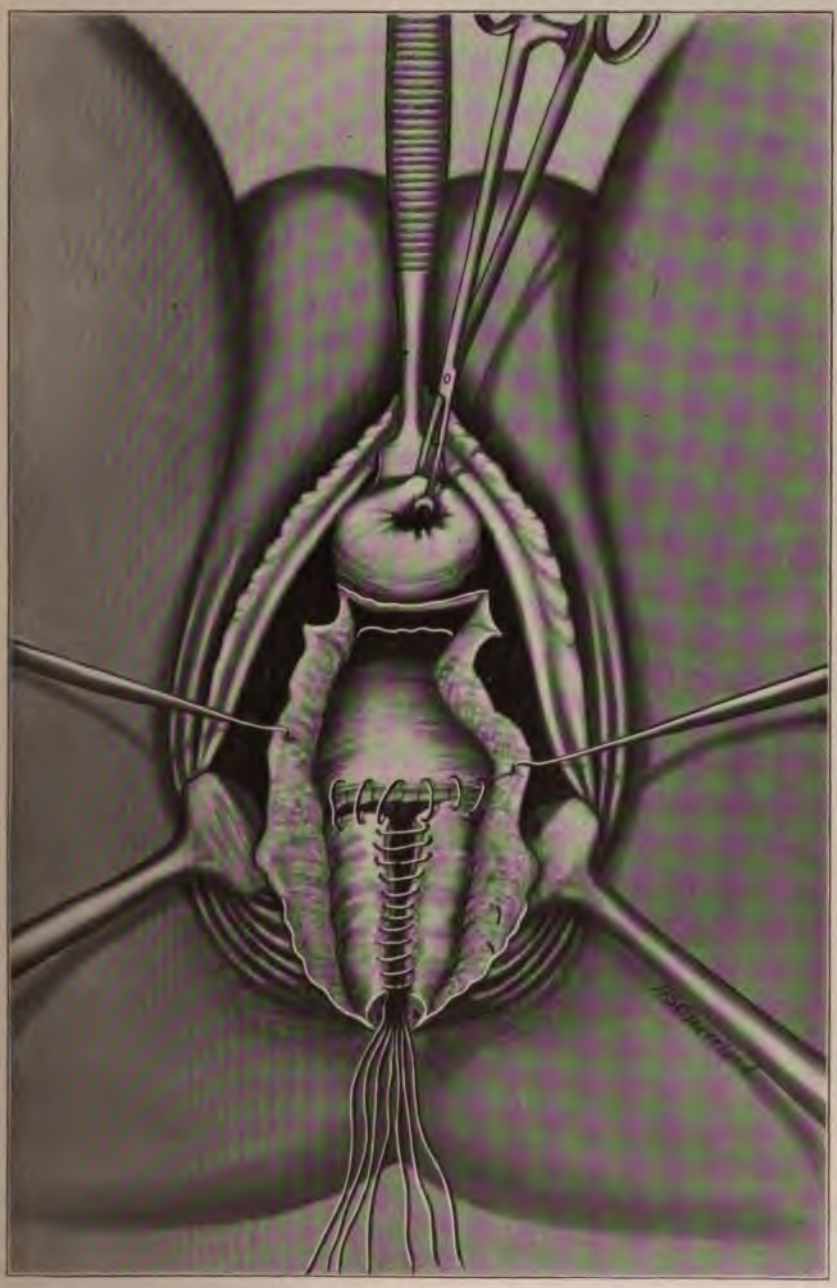
The anterior rectal wall, including sphincter, was divided up to lower border of the tumor and anal segment of the rectum separated from that just above it by a transverse incision.

PLATE IX.



The proximal end of the sigmoid was grasped with vulsellum forceps, closing it completely, and by the use of curved scissors separated from its attachments upward to the promontory of the sacrum.

PLATE X.



The sigmoid and the sphincter segment of the rectum were united end to end with silk sutures.

PLATE XI.

The vaginal wall was sutured to the cervix, closing the transverse incision, and the edges of the vertical cut united in the central raphe with silkworm-gut sutures.

I found it exceedingly difficult to liberate the rectum in a case of syphilitic stricture with numerous fistulæ. The stricture was primarily above the peritoneal reflection and afterward involved the entire rectum to anus. There were two gluteal, one perineal, one large rectovaginal, one rectovesical, and one rectotubal fistulæ. Dense tissue around the fistulous tract as large as my thumb and an extensive area of scar tissue caused such difficulty in the dissection that scissors were constantly in use, and in spite of this my hands and fingers were sore for two days afterward. After liberating the extraperitoneal portion of the gut, new complications in the pelvis were met; the appendages were densely adherent, there was a cyst of the right ovary the size of an orange, and the left Fallopian tube was distended with feces and urine. But beyond this point dissection was very easy except the peritoneum; each side of the sigmoid flexure required cutting two inches or more before it would descend sufficiently, the difficulty being due to dense adhesions and thickening of the peritoneum. The case was extremely complicated, but one cannot tell of all things before operating, so it is very likely that syphilitic stricture reaching above Douglas' pouch with one or more complicating fistulæ will be just as serious. Therefore, I feel constrained to caution the inexperienced against attempting this operation, though it is valuable in skilful hands, and in certain cases nothing else will serve the purpose. In the technique I advise against splitting the anal segment, as it is unnecessary and very likely to be followed by a fistula at the angle where it meets the transverse incision severing the rectum.

Intestinovaginal Fistulæ. **Etiology.**—Intestinovaginal fistulæ are produced mainly by deep lacerations of the upper portion of the vagina in childbirth. As such tears rarely extend into the peritoneal cavity, this class of fistulæ is not often met with. The opening in the peritoneum must be large enough to admit a knuckle of intestine, which, becoming strangulated, sloughs and results in a passage-way between the intestine and vagina. Adhesions between the bowel and vagina prevent the escape of feces into the peritoneal cavity.

Rapidly growing epithelium creeps from both sides over the edges of the septum, and covers the intervening raw surface before granulations can proliferate rapidly enough to fill the aperture. The possibility of spontaneous cure is thus prevented and the fistula becomes chronic.

Surgical traumæ also act as causes. For instance, a case came under my observation in which a surgeon attempted to cure an intestinoabdominal fistula by opening Douglas' pouch through the vagina to close the intestinal opening. The operation failed and complicated matters, adding to the existing intestinoabdominal an intestinovaginal fistula. This has been deliberately done, with the object of converting an abdominal into a vaginal fistula, in the hope that free drainage would effect a spontaneous cure. But as the procedure is of an experimental nature few cases only have been recorded.

Fecal abscess originating in traumatism, appendicitis, typhoid fever

and other inflammatory processes are also enumerated among the causes.

C. C. Frederick[1] describes an interesting sigmoidovaginal fistula due to occlusion of rectum and sloughing of sigmoid. There was extensive destruction of tissue about the base of the broad ligament and cervix, leaving a large aperture through which all the feces passed. It was repaired by anastomosing the sigmoid with the rectum below the point of obstruction, using a Murphy button.

Diagnosis.—The diagnosis depends upon the detection of fecal matter escaping from the fistula into the vagina. The discharges are thin, stained with bile and very irritating. Martin says:[2] "In fistulæ of the small intestine the exudate will have the consistency of chyle, varying with the location of the fistulæ, and it will be discharged at regular intervals after eating." If the fistula is very large and connected with the small intestine the patient will show signs of progressive emaciation from inanition, consequently only small fistulæ from this part of the alimentary canal run very prolonged or chronic courses. Large openings of long duration indicate involvement of colon, cæcum, or appendix.

A clyster of colored water (methylene blue) will aid in eliminating fistula of the rectum and sigmoid. If it cannot be made to return through the fistula, and if a probe inserted *per vaginam* into the sinus cannot be felt with a finger in the rectum, nor seen with a long proctoscope, this fistula must be connected with the intestine above the rectum.

The diagnosis between the fistula involving large or small intestines depends upon the character of the discharges. In fistulæ of the small intestines the discharges are chylous in character and escape at regular intervals after eating, while those involving the colon and cæcum deliver fecal matter into the vagina regardless of meal-time.

When fistula is accompanied with history of acute appendicitis with abscess it may be assumed that it originated about the head of the cæcum.

Treatment.—The treatment is essentially surgical, and the operator must undertake it with the expectation of resecting the portion of the bowel involved. These operations are serious and very difficult to execute, as trying contingencies may arise when least expected.

Suturing the opening in the bowel is an unsafe measure, for colon bacillus infection is so common in the walls of the intestine about the wound, and softened tissues do not hold sutures well. Even a layer of plastic lymph over the wound does not ensure safety, for it is susceptible to infection, and, when softened, yields to tension and intraintestinal pressure, permitting the wound in the bowel to open again. Feces escape into the abdominal cavity and a condition fraught with danger presents itself.

There are exceptions to this rule, as some cures have followed sutures

[1] American Journal of Obstetrics, November, 1901, p. 677.
[2] Martin (Cushing's), p. 336.

of the intestinal wound, but they occur in the simplest form of cases and in the absence of pre-existing infection. Resection is resorted to after repeated attempts at suturing the intestines have been made.

In my experience there was one case with limited adhesions in which I succeeded in dissecting out a part of the tract, including a cuff from the wall of the vagina, in such a way that a stump was left on the bowel resembling the stump of an appendix, and it was an easy matter to treat it as an appendectomy; but this fortunate case should not lead me to believe that I shall encounter another of the kind. In fact, with this one exception I have found fecal fistulæ communicating with the intestinal canal above the rectum exceedingly complicated.

The operation essential is that ordinarily applied to resection of the bowel, but there are some features requiring notice here. In the first place the vagina as well as the abdomen should be antiseptically prepared, and when the patient is placed upon the table a soft rubber bougie should be passed into the fistula from the vagina. The Trendelenburg posture should be used to aid in keeping the intestines out of the way. A large abdominal pad or intestinal retainer, such as Türck's hot-water rubber bag, or Noble's intestinal retainer, should be used to hold the intestinal coils out of the pelvis and protect them from infection or contact with feces, should any escape from the fistula, or accidental lacerations of the gut.

Separation of the adhesions is often a delicate procedure. Though light or filamentous bands may be rapidly broken up, some idea of system and anatomical landmarks must be had in order to work intelligently and rapidly. The plan I prefer is not to attempt detail separation of coils as they are encountered in the pelvis, but to turn the entire mass of adherent intestines out of the abdomen very much in the way a fibroid tumor or pus tube is elevated for inspection, and then separate the coils under the guidance of the eye. To do this the one thing uppermost in mind is the normal relations of the rectum in Douglas' pouch and its deflection to the left. If one is familiar with its attachments and the manner of its change into the sigmoid flexure, there is less danger of injuring normal parts in separating the mass of adherent intestines from the bottom of the pelvis.

The first thing is to inspect the uterus and appendages. If they are not much involved a point of cleavage may be made along the line between the adherent intestine and the posterior surface of the uterus, and the dissection made by working the mass off from the uterus by a side-to-side motion of the finger, keeping the tips all the time directed more against the uterus than the bowel to prevent perforation of the latter. If the attachment is very firm, manipulations at this point should be abandoned and the finger-tip passed along the posterior surface of the broad ligament toward the side of the pelvis where the adhesions are likely to be less brawny but more pliable. A point of cleavage having been found an attempt is made to carry the fingers from the side of the pelvis down the surface of the pelvic peritoneum in the direction of Douglas' pouch, with a view of getting a

finger under the mass and separating it from below upward. When the parts about the fistula are approached the probe or bougie in it may be detected and the exact location of the tract determined. The object of this is to avoid disturbing the site of the fistula until the surrounding attachments are sufficiently broken up to allow the perforated intestine to be drawn outside the abdomen, lest feces should escape and soil the peritoneum. After the mass has been brought up a pad should be placed over the opening leading into the vagina as a temporary guard and to absorb oozing blood.

But if upon inspection the uterus and appendages are found much involved in the adhesions, or if a satisfactory point of cleavage cannot be found, it is better to start at once with hysterectomy by the bisection method, for two reasons: first, it is the easiest and safest way to separate and deliver the tangled mass of intestines, and, second, the patient makes a more satisfactory recovery and is freer from deferred complications than when left with a raw, bleeding uterus and mutilated appendages.

The technique of bisection will be found in another chapter, but I find one point in the operation should be changed when applied in these cases; that is, when the bisecting incision has reached the adherent intestine it should be abandoned temporarily and a transverse incision made horizontally across the posterior wall of the uterus, cutting just through the peritoneum; the finger should then dissect off all, or as much as possible, of the uterine peritoneum, leaving it clinging to the bowel, to be used subsequently for covering over the denuded surface if necessary. When this has been done the bisecting incision is continued and the uterus and appendages turned out as described in the chapter giving the technique of the method. Then separation of adhesions binding the intestines to the pelvic peritoneum can be easily accomplished as the dissecting finger works from below upward with greater facility than in the opposite direction. An effort should be made to prevent the escape of fecal matter, but often this is impossible, especially if the adherent mass is large and brawny. If, however, the adhesions are limited the abdominal incision may be enlarged to admit two fingers of the left hand, and the intestine may be compressed on both sides of the fistula between the index and second fingers while the communication between the bowels and vagina is being broken through with the right hand. The intestines are drawn out of the pelvis, the coils are carefully separated and subjected to inspection. If it should prove to be one of those exceptional cases in which the margins of the opening are healthy and the fistulous tract very small, it may be closed with Lembert sutures of silk; but if the intestine has been much injured, if there has been much loss of the peritoneal covering, or if the intestine is hard and board-like about the opening, or if the fistula is large, resection is requisite to a reasonably safe operation.

Bad results sometimes arise from efforts to save too much of the intestine, for colon bacilli and pus-producing bacteria easily penetrate portions of the intestinal walls not protected by the peritoneum. The

parts to be removed are cut away after the manner of an ordinary intestinal resection, and the ends of the gut united by some mechanical device or by direct suturing.

If accessible, raw surface and the opening in Douglas' pouch should be covered with healthy peritoneum by catgut sutures; but if the pelvis has been extensively involved in adhesions and cannot be left in a smooth, healthy condition by such measures ample drainage may be secured by enlarging the fistula in the vagina, passing gauze strips through from the abdomen. This expedient at the same time keeps the intestine off the raw peritoneum in the bottom of the pelvis.

The after-treatment is the same as an ordinary resection of the intestine. If the gauze drain is put in the opening leading to the vagina it may be removed in twenty-four to forty-eight hours.

Intestinouterine Fistulæ. Etiology.—Intestinouterine fistulæ fortunately are very rare. They follow rupture or perforation of the uterus by the curette when its cavity is large enough to permit a knuckle of intestine to become engaged in the wound. The intestines become imprisoned and necrosed, resulting in a fistula after the manner described under the head of intestinovaginal fistulæ.

But few cases have been placed on record. Tuttle mentions the report of Lanue and Bidder, also of Quene and Hartmann. I will add a third by L. Grant Baldwin,[1] which recovered spontaneously, and another by R. C. Norris,[2] following prolonged labor and use of forceps. The opening was large enough to pass the finger through, but recovered without operation.

Very little is known of this accident. The symptoms and diagnosis, therefore, are not clearly defined. Baldwin's case followed curettage for puerperal sepsis, which was relieved, but ten days later fecal matter and gas escaped from the uterus. The fistula closed a few months afterward.

Diagnosis.—Physometra may be confused with this condition, as gas bubbling through a dark-colored fluid is a suggestive sign, but if fecal matter or bile-stained discharges are not present the escape of gas need not be regarded as an evidence of a fistulous communication. A fistula that permits the escape of gas, but is too small for fecal matter to pass through, is so nearly closed that it may require no attention. However, a bacteriological investigation for bacillus aërogenes capsulatus will set aside any doubt that may exist.

These bacilli have been found in sloughing fibroids and carcinoma (Kelly), so when these diseases are known to be present an examination for bacilli is unnecessary.

Sometimes the symptoms in suspected cases may be confusing. For instance, I performed hysterectomy (July, 1903) when the diagnosis of intestinouterine fistula might easily have been made by mistake. Pus, gas, and a dark-brown fluid with fecal odor were coming from the external os, but the uterus was small and there was no history of

[1] American Journal of Obstetrics, April 19, 1901, p. 259.
[2] Ibid., 1902, p. 104.

recent injury by curette. The uterine cavity was smooth, but the curette brought away a finger-like growth slightly necrotic where it had been compressed by the internal os during contraction of the uterus, which occurred at intervals. It was two inches long and one-fourth of an inch in diameter. This specimen proved to be adenocarcinoma. After removal the uterus was split open; the cavity was apparently healthy except at three points, one near each cornu and a third just within the internal os. At these points finger-like prolongations were hanging, all springing from the posterior wall.

In this case the escape of gas and dark-colored fluid with fecal odor suggested fecal fistula, but, upon the other hand, the small size of the uterus, the absence of actual fecal matter, and history of traumatism excluded such a diagnosis. It is necessary, therefore, to take into consideration and be largely governed by a history of rupture of the uterus or perforation by the curette.

The main point in the diagnosis, however, rests upon the presence of fecal matter or chyle oozing from the os uteri.

Treatment.—Treatment consists in keeping the parts as clean as possible and thus encouraging granulation, with a view of spontaneous closure. Drainage from the uterine cavity should be ample in order to allow escape of feces and return of cleansing fluids; when necessary the cervix should be dilated for that purpose. Great care should be observed in dilating the uterus, as it tears under the influence of very little force when softened by septic inflammation. An accident of this sort would not only seriously complicate the treatment but might hazard the life of the patient. Injections through the fistula from either uterine or intestinal side are impracticable: first, because the opening in the uterus is next to impossible to locate; and, second, the intestinal end of the fistula connects with the bowel too high up for rectal injections to be forced through, no cases having been reported with the rectum involved.[1] Again, the calibre of the tract is too small for successful irrigation. Peroxide of hydrogen thrown into the uterus will blow back into the bowel, but may delay healing by distending the tract and tearing up new granulations. Mild antiseptic douches in the uterus and vagina, such as permanganate of potash, 1 to 2 per cent.; carbolic, 2 per cent.; and boracic acid solution followed by iodoform emulsion will accomplish all that can be expected from simple treatment.

Should a case become persistent, continuing six months or longer, some operative interference will be justifiable, perhaps abdominal section, resection of intestine, and closure of peritoneum over the uterine opening.

Rectovesical and Enterovesical Fistulæ.—There is little concerning the female to be found in literature on this subject. The disease is more frequent in the male on account of the close relation between the bladder and the rectum; when vesical puncture through the rectum was practised its appearance was not so uncommon. On account of the fact that the vagina and uterus are placed between the bladder and rectum

[1] Petit, Tuttle, p. 446.

many causes that result in rectovesical fistulæ in the male become rectovaginal in the female. But subjection of women to frequent attacks of pelvic suppuration render them more liable than men to enterovesical form.

The character of these fistulous tracts varies considerably. They are direct when the intestine is intimately connected with the bladder; indirect when the passage-way is through an abscess cavity, Fallopian tube, etc., and when due to stricture of the rectum. In the last-named instance the tract may take a very irregular course, the stricture causing an abscess, which subsequently empties into the bladder. These conditions are grave, the subject dying in a few years from exhaustion, dependent upon abscess formation, septic absorption, urinary extravasation, and extension of infection from the bladder through the ureters to the kidneys.

Etiology.—They are mainly due to inflammatory processes, such as a pyosalpinx opening into both intestine and bladder, infected ligatures following removal of appendages, appendicitis, typhoid fever, stricture of rectum, carcinoma, etc. They are also due to surgical and other injuries. It is presumed that tuberculosis bears about the same causative relation as to anal and rectal fistulæ, but statistics are so meagre that this point is questionable.

Diverticula of the bladder containing calculi may become infected, suppurate, and discharge into the intestine. Foreign bodies may become lodged in diverticula of the bowel, ulcerate through its walls, excite adhesions to the bladder, and finally penetrate that organ.

The following cases illustrate passages of foreign bodies from the intestinal canal into the bladder:

I remember that Dr. Summy, of Stone Mountain, Ga., exhibited to the Medical Association of Georgia some years ago a piece of lead-pencil which he had removed from the bladder, claiming that it was swallowed by the patient, and that it entered the bladder as above stated. The case seemed to be authentic, as the late Dr. W. F. Westmoreland supported his view.

Robert L. Guess, white, male, aged thirty years, stone-cutter. History: In August, 1900, was lying down picking his teeth with a pin, accidentally swallowed the pin; experienced no symptoms for about two or three months, when back (over region of kidney) began paining him, especially on getting up mornings; then followed painful and difficult urination, with discharge of fresh-looking blood from urethra, later on bloody mucus; defecation very painful (pains ranged from "small of back" to head), and followed immediately with hemorrhage from bladder. These symptoms kept up for nearly a year, when patient passed the pin per urethra (head first), with calculus formation around it, the point having a pearl-like formation about the size of a No. 3 shot enveloping it entirely. Patient has had no further trouble with back, bladder, or rectum since passage of pin (J. R. Wells, Stone Mountain, Ga.).

Tuttle reports two cases, one being ascribed to stricture of the rectum,

the other to a cause unknown. He also mentions a case reported by another author.[1]

Crypps detailed a case in which the mass connected with the bladder was inflammatory in character,[2] and Kelly quotes R. Harrison's case. Three others have come under my observation. In one of these I extirpated the rectum of a woman in the Grady Hospital May, 1903, after Murphy's method, the Fallopian tube serving as a conduit for the passage of feces and urine. I saw also an instance in which an infected silk ligature on the ovarian stump was the cause of a large abscess that communicated with both of these organs. Feces and urine flowed through it for some months, but it finally closed. Up to 1902, 89 cases in both sexes have been reported.

Diagnosis.—The most characteristic symptoms are urine in the rectum occurring independent of micturition—that is, constantly; the presence of feces in the urine voided per urethram, and gas bubbling from the meatus. When the sphincter ani is weak urine will dribble from the rectum; if the sphincter muscle contracts strongly this will not occur, even though the passage connects with the bowel low down.

Examination of the rectum and sigmoid may locate the opening in the bowel and determine whether the fistula is rectal or intestinal. Evidence of catarrhal inflammation will be seen in the rectum, with more or less induration and depression about the fistulous opening. Uric acid crystals in discharges from the rectum indicate urinous feces. Bimanual examination may detect hard inflammatory masses closely attached to the bladder, which, though a suggestive sign only, may assist in locating the fistula.

In examination from the bladder side we should look first for the escape of gas from the meatus. Massage from the lower abdomen and bladder may force it through the urethra. The urine should be examined for feces, which may be lumpy or fluid; particles of solids may also be forced through the urethra. Crypps observed in one instance that the color of the feces in the urine corresponded with that of the feces in the rectum, and from this inferred that the fistula was situated low in the bowel or was rectal in character. But the character of the feces is not a positive sign of the location of the fistula, for rectal contents are at times fluid, and even solids may pass through from any portion of the intestinal wall. The cystoscope will show signs of crystals and an inflamed area around the bladder opening. Not infrequently granulation may obscure the aperture, but a probe or a searcher introduced through the cystoscope will clear up all doubt. Injection of fluid into the bladder is not a satisfactory aid in diagnosis, especially if the fistula is small or tortuous. In one of my cases the tract for three inches consisted of Fallopian tube, and large enough at the rectal end to admit two fingers, yet it was impossible to force fluids through from the bladder. It seems that varying positions of the bladder, produced by distention, obstruct the canal by kinking or pressure, whereas, urine

[1] Tuttle, Diseases of the Anus, Rectum, and Pelvic Colon, 1902, p. 440.
[2] Crypps' Ovariotomy and Abdominal Surgery, 1898, p. 584.

may percolate through when the bladder is more or less relaxed. This circumstance results, perhaps, from a disturbance of the relations of bladder and fistula to constricting bands and pelvic exudates.

Hydrogen gas has been injected after the manner of Senn's gas test for gunshot wounds in the abdomen. After catheterization the gas is injected into the bowels, and if it returns through the bladder it may be detected by setting fire to the end of a catheter previously inserted into the urethra.

Having decided that a fecal fistula does empty into the bladder the next thing is to locate the intestinal end. This must be done by exclusion; that is, careful examination of the rectum as above described should either affirm or deny its connection with that part of the bowel. If connected with the intestinal canal above the rectum its exact location need not be determined before operating, for it is then evident that extraperitoneal pelvic operations are not to be considered but that the abdominal cavity must be opened.

Treatment.—A very small percentage of these cases recover spontaneously under the most favorable conditions. There may be no objection to temporizing in recent cases of rectovesical fistulæ, if they are small and the vesical and rectal mucosa show but little effect of the disease; but as the danger of cystitis, ascending ureteritis, and infection of the kidneys is always great the condition should be closely watched. Careful cleansing of bladder and bowels should not be neglected. The bowels should be constipated and daily flushing of sigmoid and rectum practised; the bladder must be drained by a self-retaining catheter and irrigated daily with a solution of boracic acid, 2 per cent.; argonin, protargol, or other silver salt, or 1:10,000 bichloride of mercury solution, taking care that an excess of the latter is not left in the bladder.

If this treatment does not improve the local condition, or if catarrhal or septic infection of the bladder continues to increase, it should be promptly discontinued.

The treatment is essentially surgical and is divided into palliative and curative. The prime object is to divert the flow of the feces from the fistula. Formerly, attempts to close the rectal end by suture were practised, but the ever-present infection thwarted most of them. In the male the perineum has been split open and the rectal wall closed, but with poor success, so this class of cases was looked upon as serious in either sex.

PALLIATIVE TREATMENT.—This was done by colostomy, an inguinal anus being formed. In it rested the hope that by diverting the flow of feces the lower bowel might be kept clean and the fistula be allowed a chance to close by granulation; but such results are rare.

George Brown, of Birmingham, Ala., reported a successful case before the Southern Surgical and Gynecological Association, 1900, in which he did this operation after many failures to close a fistula by other means. Six months after the artificial anus was made the tract healed completely. Crypps detailed a case in which he said the patient

was made more comfortable, but it seems to me that the discomfort of an inguinal anus is sufficient cause to demand more radical measures, except in advanced cancerous cases where colostomy is the only means of affording any relief.

CURATIVE TREATMENT.—Curative treatment by surgical means is divided into pelvic and abdominal operations.

Pelvic Operations.—If the fistula connects the bladder to the rectum below the peritoneum it should be treated as a rectovaginal fistula by either the Dudley-Segond operation for removal of the lower end of the rectum or the Murphy operation for extirpation. The former must be confined to practically normal conditions of the rectum, when the fistula is not above the floor of the cul-de-sac of Douglas. The Murphy operation is applicable to stricture cases when the fistula does not open into the intestines above the rectum. Proctoscopic and digital examinations will decide the indications for either of these operations.

The fistula is converted from a fecal to a urinary fistula when cut off from the bowel, and then requires separate consideration. Now, what is best, if anything at all, to be done with it? In my experience drainage of the bladder end into the vagina and permanent catheterization is the safest for two reasons: First, these patients are usually worn down by the disease and do not stand trying operations well; the probabilities are, therefore, that after the rectum has been resected they are not in a condition to stand surgical treatment of the bladder end of the fistula. Second, if the fistulous tract cannot be easily traced, or a probe passed through, it will not be possible to dissect it out with a reasonable degree of safety.

Abdominal Operations.—If the fistula is transperitoneal and opens into the viscus above the rectum, as many abscesses do, an abdominal section is necessary. It involves resection of the intestine and suturing of the bladder opening. If there is much injury or loss of bladder wall an extraperitoneal drain should be used to guard against extravasation of urine in case of failure; or the wound may be reinforced by sewing the uterus over the bladder sutures when the perforation is in the vesicouterine pouch. Most fistulæ of this kind are situated low enough in the bladder to make this feature of the operation practicable.

CHAPTER VI.

URINARY FISTULÆ CONNECTING WITH THE FEMALE GENERATIVE ORGANS AND THE RECTUM.

By GEORGE H. NOBLE, M.D.

Vesicovaginal Fistulæ.—Vesicovaginal fistula is an unnatural opening between the bladder and vagina, through which urine escapes. Technically, such a communication is not a fistula unless it is lined with epithelium. In the consideration of the subject fistulæ due to cancer will receive very little attention, as they are usually beyond relief.

Etiology.—These fistulæ result from prolonged pressure of the fetal head, squeezing the parts between it and the pubic bone, more than to intense pressure of less duration. It is usually associated with slight contraction of the pelvis (Kelly). The obstetrical forceps have been charged with the responsibility of this accident, as they are employed in the class of cases in which prolonged pressure occurs, and it is more natural to attribute misfortune to violence than to an invisible pathological process. Though forceps, cephalotribes, and other obstetrical instruments may cause this trouble, it is an exceptional thing and occurs only in extraordinary circumstances or in the hands of very clumsy operators.

Lacerations of the uterus do not have a tendency to involve the normal bladder on account of the ease with which it separates from its attachments. Tears are not inclined to extend beyond the cellular space as the bladder naturally slips out of reach; lacerations, therefore, follow the direction of least resistance, which is along the fatty space around the vagina and in the base of the broad ligaments. However, exceptions may be made when the bladder is fixed to the uterus and vagina by dense adhesions. In such circumstances it (the bladder) cannot recede from its intimate relations and, therefore, is liable to injury. For instance, the late Dr. V. H. Taliaferro, in 1882, closed a fistula extending from the urethra to the internal os uteri after Sims' method. The bladder became so firmly adherent to the vagina it was necessarily injured when the uterus was lacerated in a subsequent confinement.

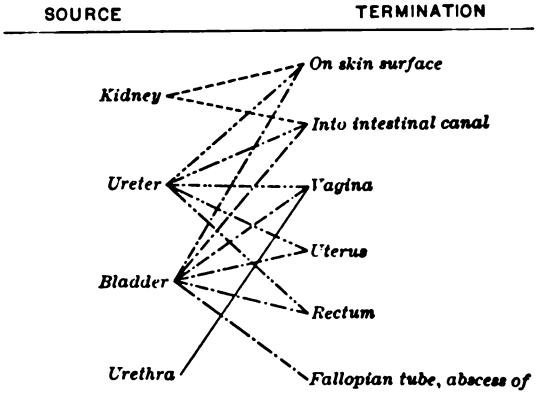
Calculi occasionally ulcerate through the vesicovaginal septum when impacted or lodged in diverticuli, the so-called encysted stone. H. F. Lechmere Taylor[1] removed a stone from the vagina weighing two ounces and one hundred grains, which escaped from the bladder in this

[1] British Medical Journal, November 10, 1900.

way. The late Henry F. Campbell,[1] of Augusta, Ga., and others have reported similar experience, and quite recently I operated on a woman at the Grady Hospital, Atlanta, Ga., in whom fistula was twice produced in this manner. In 1891, I closed a large fistula in this woman, and unfortunately either left a small pocket in the wound or a suture ulcerated into the bladder, causing one to be formed; for two months afterward a small calculus was discovered in the old scar, with one point projecting into the vagina. The opening was enlarged, the bladder carefully explored, and a few phosphatic crusts were removed from the anterior wall just behind the symphysis pubis, and the wound closed. Nine years afterward (1900) she passed a stone through the vagina, and had following it escape of urine through the fistula. She returned three years later (June, 1903), when I found the fistula large enough to admit my index finger, situated an inch anterior to the old scar and near it a calculus impacted in the neck of the bladder.

FIG. 79

URINARY FISTULAE



Tait and Schroder have observed ulcerative perforation from chronic catarrh of the bladder (Pozzi). Ulcerations due to tuberculosis rarely extend through the septum; those of syphilitic origin are perhaps not so infrequent.

Among the causes surgical injuries are second to pressure in childbirth. In hysterectomy the bladder is occasionally penetrated, and when the internal iliac arteries are tied the blood supply is materially diminished, occasionally causing its posterior wall to slough. There is great liability to this accident if the muscular fibres are spread apart in wide trabeculæ when the bladder is thinned by stretching over a wide section of a large tumor. After separating it from the tumor there is very little left beside mucous membrane, and its vitality is so impaired that the greatest care to fold in and stitch over the weak places may fail to prevent this unfortunate result.

[1] Transactions of the Southern Surgical Association, 1890, p. 185.

Symptoms.—In the beginning the most pronounced sign is escaping urine. It usually occurs three or four days after labor and may come away to a limited extent at first—that is, before the entire slough separates—but later when the dead tissue is detached all the urine may flow through the opening. At times the superior wall of the bladder may project into medium-sized fistula like a ball valve and check the flow of urine when the bladder is partially filled; the incontinence, therefore, may be intermittent, occurring only when the patient's position (on the side) prevents plugging of the opening. Or, if it is extremely small the urine may collect in the vagina, to escape when the patient is making some bodily exertion. Later in the progress of the case the urinous odor becomes pronounced.

The woman is unfit for the society of her friends, and is an object of loathing to her family. She becomes depressed in spirit, pale, anæmic from close confinement and semi-invalidism. The external parts may become excoriated, œdematous, and phosphatic deposits not infrequently collect upon the hairy growth. If the fistula is very large the bladder may be inverted through it and protrude between the labia. When thus exposed it becomes irritated and inflamed from friction infection, appears very red and angry looking, and papillomatous growths or hypertrophied points on the mucosa may appear as so many soft velvety protuberances which bleed on slight friction. The bladder grows sensitive and is easily excited to contraction and straining, a condition of tenesmus, etc.

When exposed in uncleanly persons it is subjected to the effect of flies and other insects. I saw live maggots upon the everted bladder of a negro woman who attended my clinic.

The vagina bears contact with urine very well, but if it becomes constricted or pouched so as to collect urine and mucus, vaginitis will follow. Infected mucus finding lodgement on a roughened surface or in a recess, either in a bladder or vagina, may become a nucleus for a calculus or phosphatic incrustation. If the fistula is very large the lower extremities of the ureters will likely be involved or destroyed by sloughing. Their openings will be found on the edge of the septum or close to the transverse scar, marking its site. If the outflow of urine is interferred with by pressure or stoppage of the ureters they dilate, and have been known to collect quite a quantity of urine. In some cases, where the greater part of the anterior vaginal wall is gone, it is not an uncommon observation, with the patient in the knee-chest position and the bladder depressed by a cotton ball in the grasp of long forceps, that the ureters eject in spurts or even continuous streams much more urine than the normal ureters can contain and void it faster than the kidney can excrete it. This is significant of dilatation of the ureters.

Tortuous Tracts.—As a result of extravasation of urine complicated fistulæ with long tortuous tracts may occur. Freund[1] describes two

[1] Monats. f. Geb. u. Gyn., Bd. vi., Heft 4. American Journal of Obstetrics, January, 1898, p. 125.

unique cases. One, a woman aged twenty-three years, received a penetrating wound by falling upon a fence picket, the fistulous tract commencing above the anterior columna nugarum and extending under the mucous membrane in a posterior direction, again appearing toward the left of the posterior fornix. From the latter point the tract described a curve, and finally ended in the bladder.

The other case was in a woman aged twenty-nine years, who was injured in instrumental delivery. "The fistula opens in the anterior fornix, from where a branch extends around the vagina, encircling the rectum, to appear again on the anterior surface of the sacrum, where it is connected with a large abscess cavity."

Location.—As the commonest cause is prolonged pressure by the fetal head, the portion of the vesicovaginal septum most likely to be pinched is the lower half, on account of its proximity to the pubic bone. But the cervix uteri may present at the vaginal orifice in labor and become involved in the slough, or it may extend farther, communicating with the cavity of the uterus above the internal os.

Small fistulæ usually occur in the lower third of the vagina a little to one side of the median line or close behind either ramus of the pubic bones. This is due to obliquity of the fetal head, making pressure more continuously upon one ramus than the other. The soft parts in the median line are protected by the urethral cushion and the sharp angle of the pubic arch when the presenting parts are too large to fit closely under the bones.

The slough in large fistulæ occurs in disproportion of the fetal head and pelvis, and is produced by pressing the parts against the posterior surface of the os pubis, consequently a greater surface is exposed and the entire floor of the bladder may be destroyed. By cicatricial contractions a single opening may be converted into two or more fistulæ, some of which may escape detection in a casual examination.

Diagnosis.—After labor dribbling of urine appears as the first suspicious sign. It should be distinguished from distention of the bladder and overflow. Catheterization and evacuation of a large quantity of urine followed by cessation of dribbling clears up this point. But if little or no urine is drawn by the instrument and the dripping continues is is likely due to fistula, yet the meatus should be inspected to see if the incontinence is due to temporary paralysis. In that case the urine can be seen escaping from the urethra, or, if the bladder is not entirely empty, it may be forced out by expression, unless the urethra is kinked by the dropping back of the bladder. In fistula loss of urine takes place three or four days to a week after labor. In paralysis it comes on earlier.

The injection of sterile milk or colored fluids will decide the question by escaping through the vagina in case of fistula or returning through the urethra when the bladder is intact.

In digital examinations the finger may feel the soft cracking tissue if the slough has not entirely separated, or it may enter the bladder, feel the soft pulpy mucosa and funnel-shaped depression of the internal

urethral opening. A probe or sound passed through the urethra comes in contact with the finger at once and all doubt is cleared away.

In late cases the finger will detect scar tissue in ridges or folds and perhaps no opening at all in small fistulæ. I have located capillary fistulæ by placing red litmus paper on the anterior wall of the vagina, with patient in knee-chest position, and injecting an alkaline fluid into the bladder. The change in the color of paper will easily be detected where the urine escapes.

After diagnosis of fistula has been made it is important to see if it is complicated with a uterine or ureteral fistula, for if such things exist the patient's condition will not be improved unless they are also closed. Such an oversight is a source of dissatisfaction to the patient and mortification to the surgeon. (The diagnoses will be found under their respective chapters). There are also some hindrances that may be embarrassing to the operator, such as cicatricial contraction and stenosis of the vagina, that may require preliminary attention. Fixation of the uterus by adhesions, brawny exudates, pus tubes, etc., or its backward displacement and imprisonment by impaction of tumors in the pelvis may interfere with the descent of that organ, and hamper successful closure of the wound. These things are not fully appreciated until encountered, but then preparatory operations for their removal and liberation of the uterus receive approbation. I have come upon cases after repeated failures due to these causes, and closed them without difficulty by preparing the way in removal of the obstacles and securing the mobility of the uterus. Therefore, it is important for one to diagnose and remove these conditions before attempting to operate for fistulæ in bad cases.

Treatment. MEDICAL.—Medical treatment is of little use. Recent fistulæ sometimes close spontaneously, but if once lined with epithelium this cannot take place.

Caustics and the actual cautery have been employed with little success and are unfit for anything but very small or oblique openings. Antiseptic washes for the bladder and vagina are useful for cleansing purposes, especially before the slough has separated and while the surface is granulating.

The parts should be thoroughly dried after cleansing and then smeared with a thick ointment of oxide of zinc as a protection against excoriations.

In chronic cases strict cleanliness should be observed, and when the urine collects and ferments in pockets behind constrictions of the vagina, frequent douching is needful.

I have found saccharine in 5-grain doses, four hours apart, a useful agent to prevent alkaline decompositions. Boracic acid and benzoate of soda are also used for this purpose.

SURGICAL. *General Consideration.*—The history of surgical treatment is so well known that little need be said here. It seems to have received but scant intelligent attention up to the time of Jobert, who, in 1850, succeeded in curing a number of cases by paring the edges,

closing with sutures, and relieving tension by cutting the tissues on the sides of the wound. But it remained for Sims (1852) to work out a system which at once placed the operation on a high plane of success. He pared the margin of the wound on a bevel to secure broad surface for coaptation and close approximation at the vesical edge. He employed the silver wire for suture, inserting it so as not to penetrate the bladder, and gave the nearest approach to an aseptic suture the world till then had ever seen.

In spite of Sims' success many large fistulæ seemed incurable, and numerous flap operations were tried, with poor success. Martin, following and modifying Jobert's plan, made a flap from the posterior wall of the vagina. Freund used the body of the uterus for the same purpose, with little success, so colpocleisis was of frequent practice up to 1894, when Sanger and Mackenrodt, each working independent of the other, developed the flap-splitting operation, separating the bladder on all sides and suturing its edges, then closing the vagina over this with a separate layer of sutures. Von Dittel had previously attempted a part of the same thing by operating above the pubic bone, separating the bladder from the uterus and closing the fistula after dissecting its edges free. To Mackenrodt is due the chief credit of developing the technique of the advanced operation for large openings involving a great part of the floor of the bladder.

Familiarity with the conditions of the parts and technique of various methods are essential to selection of the operation most suitable to a given case. For instance, the old method of Sims' is adaptable to small or medium-sized fistulæ, where the vagina is pliant and the edges of the opening can be brought together without tension; but if the vagina is rigid and contracted by cicatricial bands the Lauenstein or its modification by Ferguson is appropriate. When the tissues close to the pubic bone have been destroyed and nothing remains but a thin cicatrix and periosteum the ordinary denudation is impossible. Such cases require some method of flap making, usually taking a wide cuff from the vagina and ostium vaginæ, or extensive liberations of parts of the bladder adjacent to the fistula.

When the floor of the bladder is destroyed, separation of that organ from the uterus and vagina by Mackenrodt or similar methods is indispensable. If contraction and thickening of the bladder walls coexist, large marginal flaps from the vagina may be turned into the bladder to increase its size. Exceptionally enormous openings are encountered, involving the bladder and uterus as high as the peritoneal reflection, exposing the cavity of the uterus. These require an extensive Mackenrodt together with an extraperitoneal suprapubic operation of some kind, especially if the uterus will not permit drawing down of the bladder sufficiently to reach the upper extremity of the opening.

This is illustrated in the case of Mrs. H., who came to my infirmary with a history of prolonged labor, with impaction of a shoulder in the pelvis. She lived in the country and much time was lost in sending to the village for her doctor, who after failing to relieve the impaction

sent several miles for assistance; so altogether the impaction lasted more than twenty-four hours.

The attending physicians, failing to produce version, decapitated by sawing the neck through with a cord and succeeded in delivering the fetus. The next day urine came through the vagina, and on examination a very large fistula was found. Her recovery was tedious, passing through a siege of sepsis, pyosalpingitis, and pelvic peritonitis.

Three or four months afterward I saw her. Blood count: Red corpuscles, 2,500,000; hæmoglobin, 30 per cent. Very much emaciated, and running a temperature varying from ½° to 1½° elevation above normal. The uterus was fixed and appendages on both sides brawny and covered with exudate, filling the retrouterine space.

The bladder was open in the median line from the urethra through the cervical canal into the body of the uterus up to the peritoneal reflection. External parts excoriated and œdematous. Bladder in a stage of unrecovered cystitis.

This woman refused operation upon the appendages, thus making the repair of the fistula well-nigh impossible, but it was attempted under protest.

The ureteral orifices were plainly visible and bougies were passed into them under guidance of the eye. A modified Mackenrodt operation was done, first splitting the margin of the fistula; dissecting the bladder to the limits laterally and posteriorly it was separated from the uterus up to the peritoneal retroflection. Finding then that the bladder could not be drawn down far enough to get even a sight of the upper angle of the fistula, the dissection was continued farther, separating the peritoneum from it as far from the transverse rami of the pubic bones. Even then the ureter being fixed in the exudate in the pelvis would not allow the bladder to prolapse sufficiently. An attempt was made to turn the upper and posterior wall down between the ureters, but it failed. Then an incision was made between the recti muscles to gain extraperitoneal access to the upper angle of the wound in the bladder. This was done as the peritoneum had already been stripped off the bladder, and because the patient refused to have the abdominal cavity opened.

Through this incision the laceration in the uterus, extending two-thirds the distance above the internal os, was closed, and a line of sutures two and a half inches long placed in the superior angle of the fistula, which closed the bladder down to the level of the ureters, but lacked fully an inch of reaching the ureteral openings.

The abdominal wound was then closed, and the remainder of the bladder opening sewed up from the vaginal side. Extreme difficulty was experienced in reaching that portion of the opening between the lower extremity of the ureter and the lowest stitch introduced from above the pubic bone, consequently I fear it was imperfectly done, as a small opening was found at this point a week later. A subsequent operation was necessary to relieve this defect, but she made a final recovery.

This was an extreme case and one of the most difficult pieces of work I have ever undertaken. The fault being due to fixation of uterus and appendages of brawny exudate. Never again will I tax myself so much to humor the whim of a person prejudiced to removal of so seriously diseased appendages. The woman should have had an abdominal section first, and after recovery closure of the fistula. In this way the operation would have been done with much less difficulty.

PRELIMINARY TREATMENT.—When the parts are in an excoriated or inflamed condition preliminary treatment by washes and salves, organic silver preparations, etc., are useful, as such conditions not only add to the patient's discomfort but increase the risk of infection.

Formerly dilatation of the vagina with plugs and tampons, clipping of contracting bands, etc., was practised to increase the working space and soften the field of operation, but now it is the general custom to overcome these things surgically at the time of the operation. Contraction or stricture of vagina is relieved by cutting. The perineum may be split by an incision extending back to the anus or by the side of it to the region of the coccyx; the wound is repaired after closing the bladder.

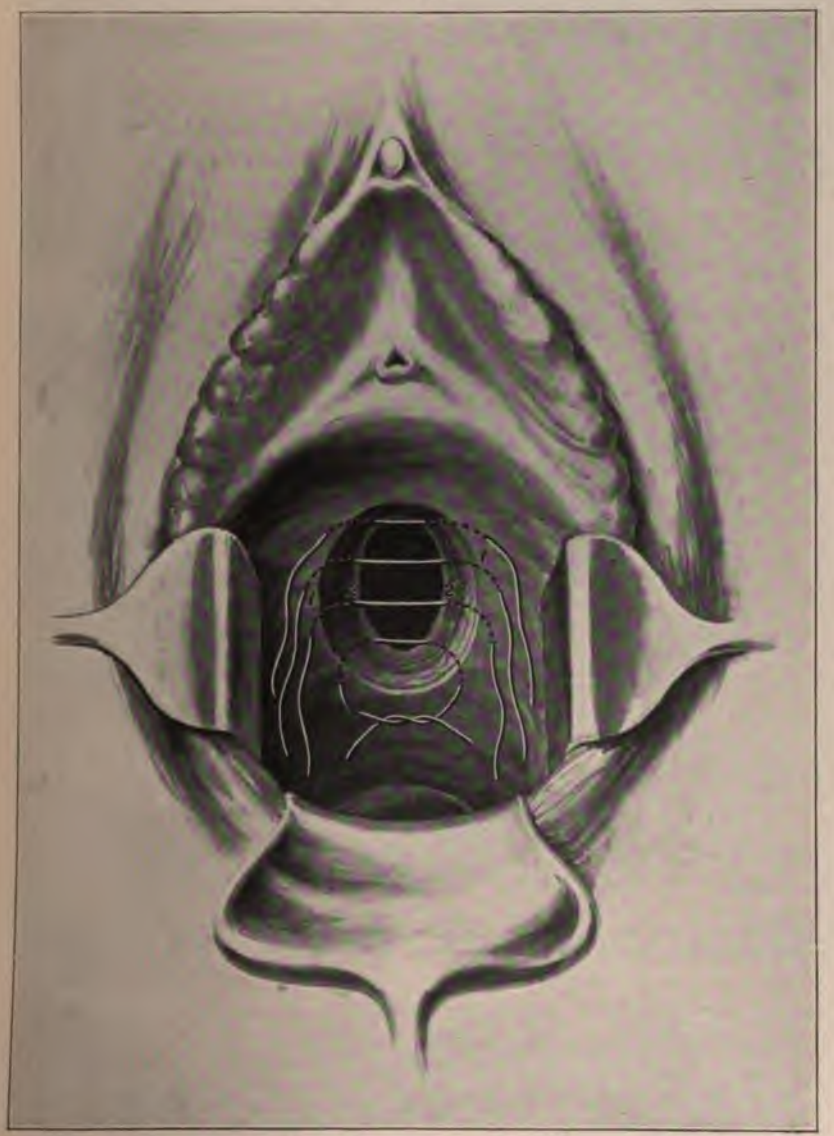
Operations for Small and Medium-sized Fistulæ. SIMS' OPERATION.—Patients may be placed either in the semiprone or dorsal position. If Sims' position is used the vagina must be exposed by a perineal retractor, usually some modification of Sims' speculum. If the dorsal (exaggerated lithotomy) position is employed a short, wide-bladed perineal retractor is frequently used, but if the uterus is drawn to the perineum with a museau forceps it may be dispensed with and two narrow retractors substituted to hold the labia apart. With a pair of long mouse-tooth tissue forceps firm hold is taken on the margin of the fistula, then with a knife or a pair of sharp-pointed scissors, curved slightly on the flat, the margin of the opening is trimmed away. The incision on the vaginal surface should be made about one-fifth of an inch[1] from the edge of the fistula. Begin cutting at the most accessible point and endeavor to remove the tissue in one long strip or ring, and as the scar tissue is trimmed away the most difficult points to reach will become more accessible. The edges are bevelled so as to make a funnel-shaped opening with the largest side in the vagina (Fig. 80). All the scar tissue should be removed, cutting through the septum to the vesical mucosa. The wound should be brought together in the direction that will put it on the least strain, usually transverse to the long axis of the vagina.

If the bleeding is annoying it may be temporarily controlled by pressure forceps and finally secured by sutures. The stitches should be introduced about three-eighths of an inch back from the cut surface and passed directly through the septum to a point about one-tenth of an inch external to the mucous membrane of the bladder, and should not emerge so close to its edges that they cannot be completely shut out

[1] In large fistulæ, especially if the parts are unyielding, the incision should be made farther away from the edge of the fistulæ, especially at the angles formed at each end of the line of sutures. When this is neglected small fistulæ frequently recur at one or both angles.

from the bladder (Fig. 81). The distance between the stitches should be about three-eighths of an inch. The wires are then twisted together tightly enough to closely approximate the wound without strangulation.

FIG. 80



Sims' operation. The margins of the fistula are turned away, making bevelled edges to the wound, giving it a funnel-shaped appearance, widest on vaginal surface 1-1, narrowest at the bladder side 2-2. Wire sutures are introduced well back on the vaginal surface and emerge from the raw surface just beneath the vesical mucosa (2-2), then cross over the opening and return in the reverse direction Sutures placed transverse to the long axis of the vagina. (Illustration after Kelly.)

The ends are cut off and turned flat on the vaginal wall. Sims used to twist the wires with a special instrument over a shield and pay much attention to shouldering them to prevent puckering or bulging along the line of union, but this is unimportant. They can be twisted with the fingers if the wire is not too large. If No. 28 is used no shouldering will be necessary, as the light wire accommodates itself more or less to the parts.

FIG. 81

Sims' operation. Vertical section of Fig. 80. Straight line shading shows method of paring the edges of the fistula and sutures penetrating to, but not including, vesical mucous membrane, 2-2. Sutures placed in the long axis of the vagina. (Illustration after Kelly.)

While Sims used a silver wire with success, we know it is not essential. Silk and silkworm, especially the latter, answer the same purpose and are easier to handle. Catgut in small fistula with no tension is serviceable, but if much strain is placed upon the wound it will open when the suture absorbs.

If silkworm is used it is tied and one end cut short, the other left long to facilitate removal, but to prevent pricking they are tied in a bundle and protected with a light gauze dressing.

About the year 1887 von Herff and Vulliet, and Walcher in 1889, split the edges of the fistula and inserted two rows of sutures, one just under the bladder edges, the other through the vaginal flaps. Walcher's technique is the one most frequently used.

WALCHER'S OPERATION.—Improving upon the idea of Blazin[1] he split the edges of the vesicovaginal septum or margin of the fistulous opening, making vesical and vaginal flaps and broadening the surface of contact. The bladder side of the wound was closed with submucous sutures introduced so as not to penetrate the mucous membrane (Fig. 82). When tied they turned the vesical flap into the bladder. The

FIG. 82

Walcher's operation. 1, buried sutures closing bladder; 2, sutures closing edges of the vagina.

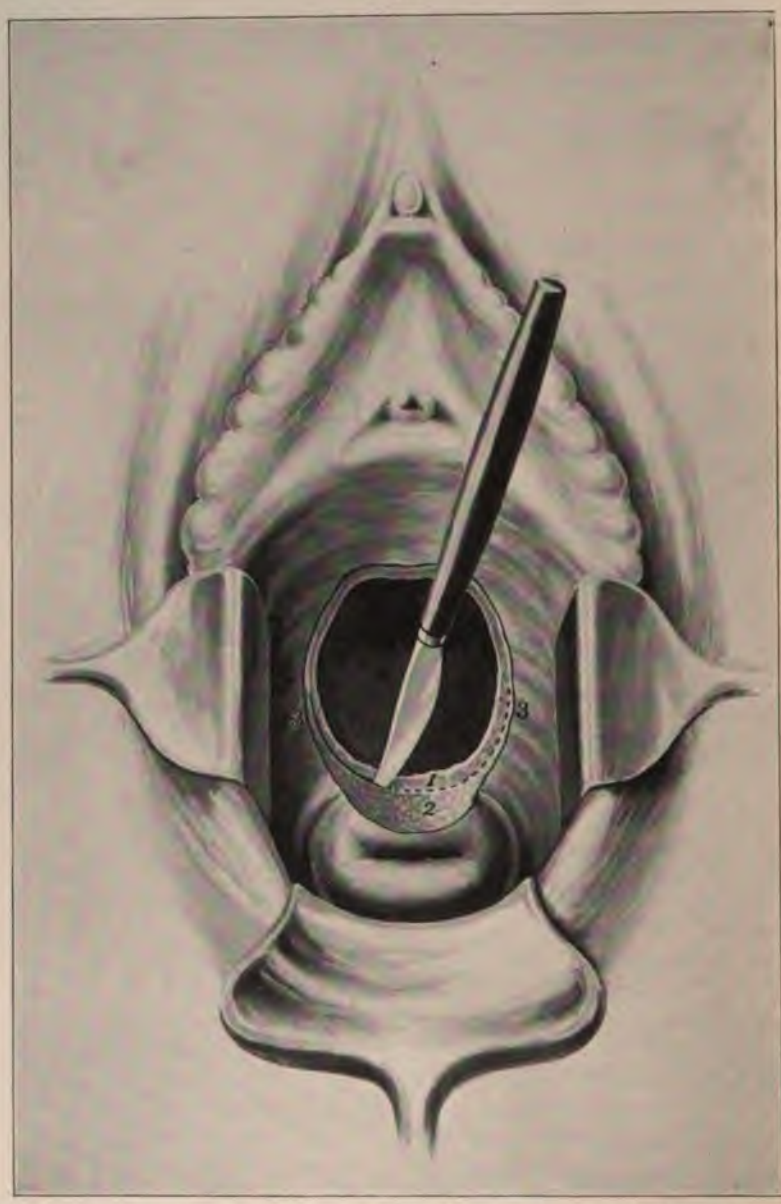
vaginal margins were closed after the manner of Sims. Langenbeck and Calles followed practically the same procedure.[2]

Lauenstein modified this operation by making two vertical incisions, one above and the other below the fistula, then connecting these by a semicircular incision running around the fistula. He then pared the edges of the opening and closed it in a similar manner to Walcher. (See technique of Lauenstein's operation for rectovaginal fistulæ.)

[1] Handb. der Chirurg.
[2] Thomas, Diseases of Women, 1880, p. 264.

Operations for Large Fistulæ. MACKENRODT'S OPERATION.—Mackenrodt conceived the plan of extending the flap-splitting idea and applying it to large fistulæ. He separated the bladder on the sides, and par-

FIG. 83



Mackenrodt's operation. The bladder (1) is dissected from the uterus (2) and the vaginal walls (3–3') until its edges meet without tension. (After Kelly.)

ticularly from the uterus. It is done by cutting into the cellular space between the uterus and bladder. He first pared the edges and removed the cicatricial tissue, then grasped a fold of the vagina, making an incision along the edges of the septum midway between the bladder and the vagina (Fig. 83). This he enlarged by blunt dissection, using the finger to push the bladder off. The separation is mainly done between the bladder and uterus, but it is also extended laterally, that is, on either side of the fistula if the bladder flap is not sufficiently movable. He then closed by uniting the bladder transversely with Lauenstein sutures, after which the vagina is closed from side to side with silkworm gut (Fig. 84).

It is important to guard against injury to the ureters, and for that purpose ureteral bougies may be used, and can be inserted under guidance of the eye in extreme cases. The lower ends of the instruments should be brought out through the urethra.

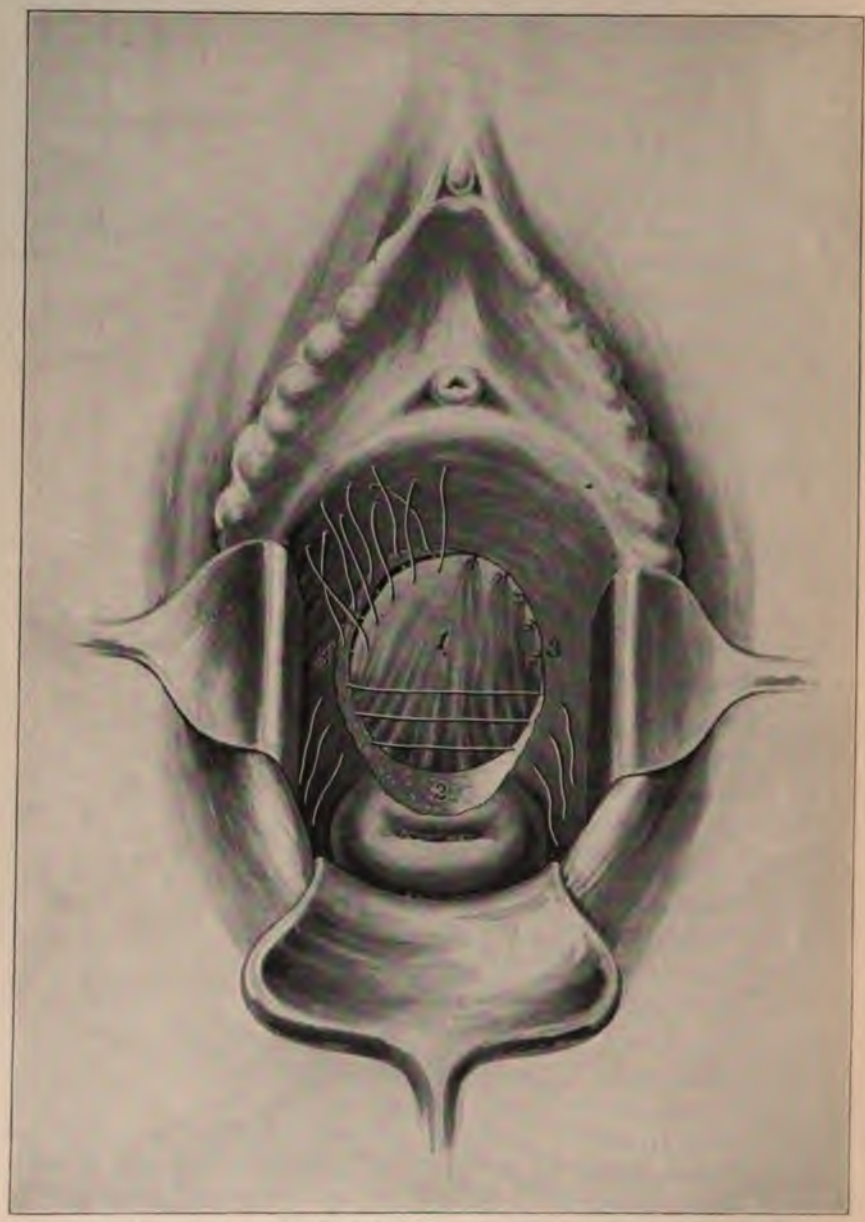
FERGUSON'S OPERATION.—Ferguson's plan varies but little from Walcher's and does not apply to very large fistulæ. (For technique see Rectovaginal Fistulæ.)

I do not use the Sims operation for any but small and medium-sized fistulæ, and even then prefer the Lauenstein or some modification of it, as they give best results, offer more working space, and are safer against entrance of urine into the wound. It is my preference, however, to leave as few knots as possible in the wound, as they are liable to infection and prevent perfect coaptation; small spaces may be left about them into which urine may percolate, with bad results. Continuous sutures may be used in two layers. Starting in one angle of the wound it is carried across to the other by inserting it just external to the bladder mucous membrane; it is then returned by making another layer external to the first, the ends of the sutures being tied at the starting point; or after closing the vesical margins a figure-of-eight or purse-string suture may be inserted in the septum between the bladder and vagina, finishing by sewing the vaginal edges with silkworm gut (Fig. 85).

It is unfortunate to close the fistula in the X- or Y-shaped line of sutures, for the sharp points of tissue in the centre of the wound are liable to slough and be followed by leakage. If the Sims operation is attempted and the edges of the wound do not come in easy contact, either in straight or curved line, change the method to either the Lauenstein or Mackenrodt operation; that is, dissect the bladder off from the vagina and close its edges by one or two rows of buried catgut sutures in the transverse direction. Then the vagina can be brought together in the direction of least resistance, usually from side to side. If the vaginal margins cannot be approximated without tension bring the cervix down low enough to cover the wound and fix it in position with silkworm stitches (Figs. 86 and 87).

While it is objectionable to thus displace the uterus it need not be a permanent thing, for after the vagina has become more or less dilated and elongated, as it does in married women, the cervix can be subsequently released and the uterus restored to its normal position.

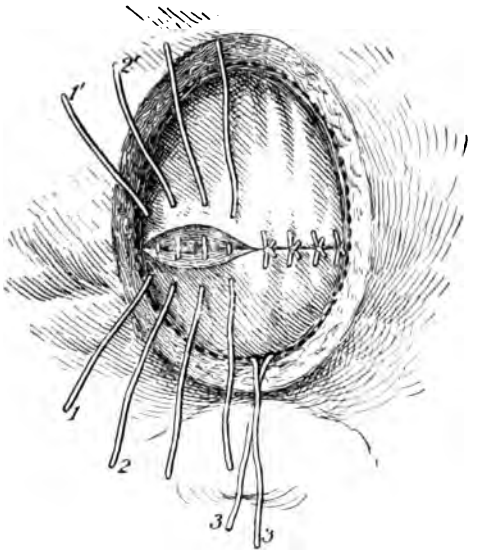
FIG. 84



Mackenrodt's operation. The bladder is closed more or less transversely, drawing the part (1) which has been separated from the uterus forward, thus making a U-shaped line of sutures. The latter should be catgut and passed through the edges of the bladder without penetrating its mucous membrane. The vaginal wall (3–3') is then closed with silkworm-gut passed from side to side without entering any part of the bladder wall. The catgut stitches in the bladder are completely buried. In a large fistula Kelly modified this operation by leaving the vaginal walls to close by granulation. (After Kelly.)

As an illustration I will mention a case of mine in the Grady Hospital, Atlanta, Ga. The entire anterior wall of the vagina and base of the bladder were destroyed; the ureters opened on the edge of the scar tissue at the side of the cervix uteri. There was an ovarian cyst the size of a cocoanut, driving the uterus backward in the hollow of the sacrum, holding it there by the short pedicle of the cyst and adhesions of the uterus. The woman was operated on six times by three different men without success, each attempting to do a Sims operation under unfavorable circumstances. Realizing the difficulty, I removed the tumor, then did a modified Mackenrodt operation, and, as the bladder walls were thickened and contracted, made wide flaps from the sides of the vagina, turning them into the bladder. This left about half of the vagina denuded of mucous membrane so it could not be brought

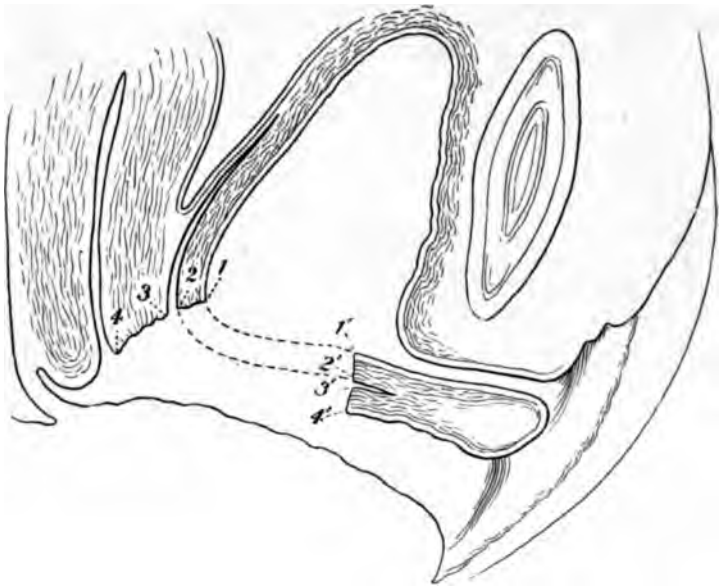
FIG. 85



Purse-string suture (3–3) in the vesicovaginal septum in operation for vesicovaginal fistula.

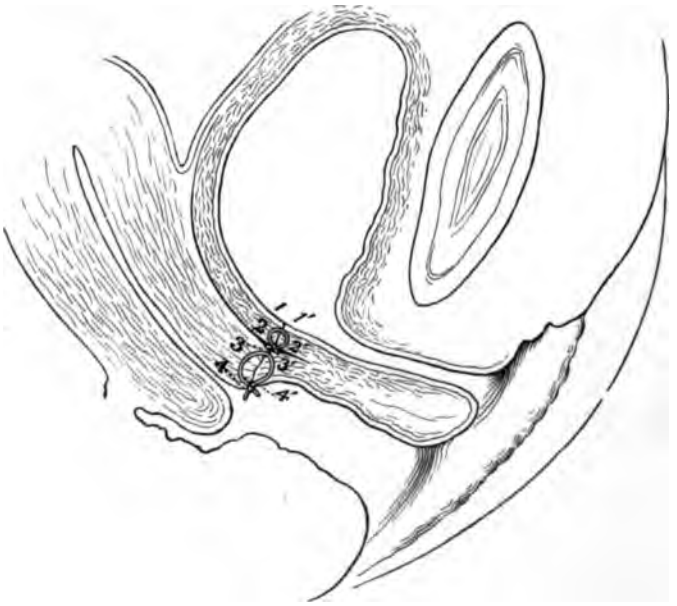
together in the median line. The uterus was pulled down and attached to the edges of the vaginal wound at the urethra. Six months later the vagina was not only dilated but elongated. The uterus was then separated from the bladder up to the peritoneal reflection, and an incision was made around the cervix just as is done in hysterectomy, cutting to the peritoneum of Douglas' pouch and pushing it off from the vagina, the excision was then extended down the posterior vaginal wall to the bottom of the cul-de-sac. The cervix was carried backward and stitched to the extremity of the wound close to the rectum, and the mucous membrane originally covering Douglas' pouch slipped forward and used in closing the wound in front of the cervix and under the bladder.

FIG. 86



Same as Fig. 87 before sutures are tied. (Modified from Kelly.)

FIG. 87



Same as Fig. 86, sutures tied. The bladder (2) is separated from uterus (3); margins of the bladder (1 2) are united to 1', 2', then if the vaginal wound cannot be closed transversely the uterus may be brought down and the anterior lip (3, 4), united to vaginal margin at the neck of the bladder, 3', 4'. The uterus can subsequently be released.

This I have found easy to practice when the Mackenrodt operation has been done, but if the uterus has been stitched to the edge of the bladder and not to the vagina it will be necessary to take a flap from the cervix in order to prevent re-opening of the bladder.

There are many other operations unworthy of special notice, as they are but minor modifications of the foregoing and are interesting only from a historical standpoint. For instance, G. Simon[1] dispensed with the Jobert incision; that is, cutting the vagina on either side of the wound to take the strain off the stitches, and used in place of it tension sutures inserted deeply into the vagina and passed over the fistula from side to side.

A. F. McGill[2] did suprapubic cystotomy, temporarily stitching the bladder to the abdominal wound. An assistant then forced the fistula upward with the finger in the vagina. The edges of the fistula were next pared and closed with chromicized catgut, tying the knots in the bladder. The abdominal wound was closed except at the point where drainage was provided for by the use of a tube. The operation was then completed by closing the vaginal side, paring the edges and suturing with silkworm.

Freund[3] opened Douglas' pouch, brought the uterus through it, turning the cervix into the bladder, and after scraping its sides sutured it into the fistula to form a new floor for the bladder. He then removed a wedge-shaped piece from the fundus and sutured its mucosa to the peritoneal edges, thus providing for escape of urine and menses through the uterus. This operation was intended to be used only when the floor of the bladder and urethra had been destroyed. Newman, of Chicago, has attempted the same thing, the idea being original with him.

Tait and Vulleit used the purse-string suture to close a fistula, but they are not reliable except in very small openings.

Trendelenburg and Martin[4] made flaps from the posterior vaginal wall, labia, and legs, but met with poor success.

Colpocleisis is the last resort and should be tried only after failure of other means of relief. (See von Gruesdew's operation.)

Dangers.—Aside from misfortunes attending anæsthesia, kidney and heart lesions, hemorrhage, cystitis, and injuries of the ureters are the accidents of greatest liability.

Hemorrhage is not apt to become troublesome, but exceptional cases have been known to result seriously, even rupture of the bladder and death from the accumulation of blood in the bladder.

Hemorrhage in the bladder may be recognized by catheterization. When the blood is fluid it will flow through the instrument; if coagulated the boggy feeling of the clot should be imparted to the catheter unless a soft-rubber instrument is used. If excessive there will be pain from distention of the bladder, percussion dulness about the pubic

[1] Ueber die Hulsing der Blasenscheidenfistule Giessen. 1854

[2] London Lancet, November 8, 1890, p. 967.

[3] Samen. Klin. Vort., 1895, No. 118.

[4] Zeitschr. f. Geb. und. Gyn., No. 19, p. 394.

bone, and quick or rapid pulse with loss of volume, and perhaps symptoms of collapse without relief of bladder pain.

Rupture of the bladder is attended with shock and relief of pain caused by distention. If the contents are discharged into the peritoneal cavity and the patient survives the immediate effect, peritonitis will ensue. If ruptured external to the peritoneum without immediate death hæmatoma, suppuration, and extravasation of urine will follow.

Cystitis from infection rarely runs a prolonged or threatening course, unless faulty technique leads to stone formation. Small pockets left in the vesical side of the wound, knots of catgut, silk ligatures, and other foreign substances act as nuclei upon which crystals collect and form calculi. When neglected they are attended with the ordinary chances of ascending ureteritis, nephritis, etc.

Danger of injuring the ureters consists in cutting or tearing them across, especially in making extensive separation of the bladder from the uterus and vagina, and also including a ureter under a stitch. This is less likely to occur in the Mackenrodt or Walcher than in the Sims' operation, particularly if the latter is employed in large openings.

Ligation of a ureter is attended with restlessness, and intense pain in the side and back about the region of the kidney of the side obstructed. It continues for a few days and gradually subsides if recovery take place. But the symptoms are inclined to become more pronounced, the kidney enlarges slightly and is sensitive on palpitation, and uræmic symptoms appear and grow worse to an unfortunate end.

Ligation of both ureters is not likely to happen, but may be distinguished from suppression of urine by absence of history of kidney lesion, greater intensity of pain, and delay of uræmic symptoms. Uræmic symptoms in suppression from anæsthesia appear in most cases in forty-eight hours.

It is interesting to note the development of the operative treatment, step by step, as one principle after another is added; its slow progress in the eighteenth, and the rapid strides toward perfection in the last century.

In 1752 Fatio cured several cases by the use of a quill suture. Little did it contribute toward success as nothing worthy of note is accounted for the next hundred years. In 1852 Jobert and Sims awakened much interest, especially the latter; the former used simple sutures, a marked advance over Fatio; Sims pared the edges on a bevel and employed aseptic sutures, with remarkable success. Then followed splitting of the septum by Duboue (1864), whose method was improved upon by Lauenstein and Walcher (1889) by adding two rows of sutures, burying catgut under the vesical mucosa. To this Ferguson added a small flap by cutting a rim of vaginal tissue around the fistula and inverting it into the bladder. Mackenrodt (1894) extended these principles and carried them out on a larger scale, separating the bladder all round, and especially from the uterus, making the operation applicable to very large fistulæ. Martin picked up the work at this point, cutting wide flaps all around the opening and turning in vaginal mucosa to form a

new floor for the bladder. Thus has the operation advanced to a stage where almost all vesicovaginal fistulæ can be cured.

Vesicouterine Fistulæ.—As the name implies, vesicouterine fistulæ connect the bladder and uterus. The urine flows from the bladder into the uterus and escapes through the external os (Fig. 88). In such cases the vagina is not involved in the lesion. Its occurrence is rare, and, therefore, is regarded with much interest when met.

FIG. 88

1, vesical opening; 3, uterine opening; 4, vaginal opening; 1, 3, vesicouterine fistula; 1, 3, 4, vesicouterovaginal fistula. (Location of fistula after Kelly.)

There should be no confusion between these and the so-called vesicouterovaginal type. The latter have been incorrectly named and should be included in the category of vesicovaginal fistulæ, for they are nothing more, except the cervix is also implicated in the process of sloughing.

Causes.—The causes are the same as vesicovaginal fistulæ—the neck of the uterus instead of the vagina being compressed between the fetal head and bony pelvis suffers the consequences.

Obstetrical forceps seem to be responsible for a large percentage of tears extending from the cervix into the bladder, which by partial healing may leave such fistulæ between these two points. This view is

supported by some of the leading authorities. In the cases of Coe, von Herff, Kelly, Courant, and McReynolds forceps were used.

Infection of one or more sutures in Cæsarean section, resulting in abscess and perforation of bladder and uterus, may be mentioned as a cause. Savor[1] reports a case of this kind in which the fistula closed spontaneously, but re-opened at a subsequent confinement, the urine entering the puerperal uterus excited infection, which was followed by death.

They may be the result of imperfect closure of large vesicovaginal fistulæ, implicating the cervix. The late Dr. Taliaferro, of Atlanta, Ga., closed an immense fistula of this kind by direct suturing of the bladder and cervix without separating the bladder from the uterus. He failed to close the distal extremity of the wound perfectly, and had resulting a vesicouterine fistula just below the internal os uteri. On different occasions the writer demonstrated this fistula by passing a soft silver sound through the urethra and out of the cervix.

There was a period of latency in this case, the urine not escaping through the uterus for about twelve months after the operation, or until the menses returned after confinement.

Diagnosis.—This is made, first, by excluding vesicovaginal fistulæ; second, by detecting urine or colored fluids that have been injected into the bladder escaping from the uterus.

The cystoscope is a valuable aid to diagnosis. Through it a sound may be inserted into the passage and the exact location of the bladder end of the fistula determined before operating. This is a matter of some importance, for the vesical opening is not always opposite the one in the uterus; again, there may be tortuous tracts in the cellular space around the bladder, running from one opening to another, or into an abscess pocket. This was an interesting feature of Leopold's case.

If a small sound be introduced into the fistula from the uterine side, and if it can not be seen through a cystoscope in the bladder or felt with a probe passed through the urethra, the fistula must be classified ureterouterine. However, it may not be an easy task if the cervical canal is contracted. This manipulation, therefore, is not always practicable.

Being influenced by the peristaltic action of the ureter, the urine in ureterouterine fistula is apt to flow in interrupted spurts or trickle in an interrupted stream from the uterus. But in vesicouterine fistula the flow of urine will be as variable as the forces affecting the bladder. When it is distended the flow will be free; when relaxed or empty there may be little or no urine escaping from the uterus.

A period of latency has been observed in the early stages of these cases; that is, the appearance of the flow is delayed for weeks or months after receiving the injury. It does not occur in the ureterouterine form unless the opening is compressed by hard growths or infiltration due to malignancy, and then it takes place late in the progress of the

[1] Cent. für Gyn., No. 49.

disease or months after the known existence of the fistula, and will be accompanied by symptoms of hydronephrosis. It may be mistaken for spontaneous cure from which it may be distinguished later by the return of the flow. I have seen two cases act in this way.

Treatment.—Before the passage is lined with epithelium, bladder irrigating and cleansing douches in the vagina are useful to promote granulations. Small openings have a tendency to close in this way.

McReynolds records a case of spontaneous cure while he was endeavoring to get his patient in condition for operation.[1] But after epithelium has spread through the tract medical treatment or topical applications are practically useless. Out of 133 cases collected by Neugebauer[2] there were only 15 recoveries and one other died.

Operation.—Jobert cured a case by direct denudation and suture in 1849, and later Sanger split the cervix to gain access to the fistula which he dissected out and then closed in a manner similar to Emmet's trachelorrhaphy.[3] But these operations have not a very wide range of application, consequently the preferred methods are:

First. (*a*) By dissecting the bladder from the uterus and suturing the opening in the bladder. This is usually done through the vagina in order to avoid the peritoneal cavity. (Follet's and Champney's operation.)

Second. (*b*) Suprapubic method, by making a suprapubic extraperitoneal incision in the bladder and closing the opening from the bladder side, or by resecting that part of the bladder in which the fistula is situated.

Third. (*c*) By supravaginal hysterectomy and closure of the bladder opening after Courant's method.

Fourth. (*d*) Pan-hysterectomy and closure of the bladder opening in a manner similar to Mackenrodt's operation for ureterouterine fistula.

Fifth. (*e*) Hysterocleisis.

(*a*) FOLLET'S AND CHAMPNEY'S OPERATION.—Follet dissected the bladder away from the uterus by a transverse incision in the anterior fornix, and exposed the fistulous opening in the bladder. This he closed with sutures, leaving the cervical opening to heal by granulation (Figs. 89 and 90). Champney made the same dissection,[4] but after cutting through the fistulous tract and converting it into two openings, one in the bladder and the other in the uterus, closed them with buried silver wire. It was inserted close to the edges of the openings, but avoided the mucosa. The edges of the vaginal wound were then closed with silkworm-gut.

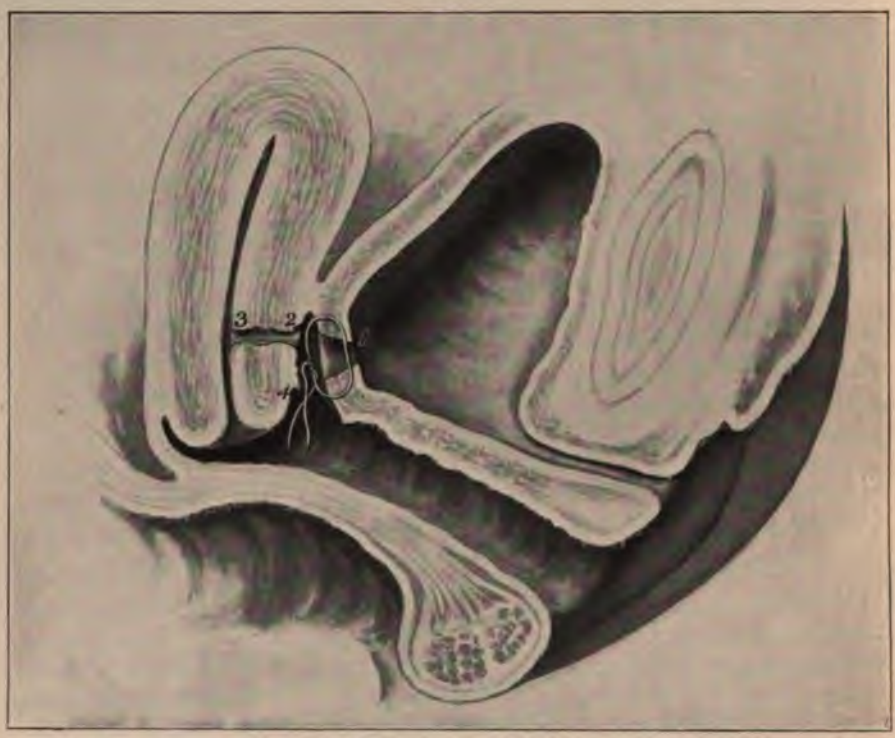
Catgut sutures are preferable for closing the openings as there is less liability to post-operative annoyances. They should be inserted fully one-fourth of an inch back from the edges (of the opening) and passed deep enough to pierce the muscular coat of the bladder, but should not penetrate the mucous membrane.

The sutures should be about a quarter of an inch apart and the ends

[1] American Journal of Obstetrics, January, 1892, p. 105.
[2] Pozzi, vol. ii. p. 324.
[3] Pozzi, vol. ii. p. 325.
[4] Transactions of the Obstetrical Society, London, 1888, p. 374.

cut short enough to be completely buried. No. 2 catgut (plain) is suitable for most cases, but if the openings are small, or if two tiers of sutures are employed in the bladder, No. 1 (chromic) will answer, for the tension is relieved by the silkworm sutures that sew the edges of the vagina to the cervix. The latter stitches should take a deep hold on the vagina and cervix, placing them close enough to prevent formation of air spaces. But this part of the wound need not be made "water tight." The same thing is done by the suprapubic route (transperitoneal), but it entails needless danger (Figs. 91 and 92).

FIG. 89



Follet's operation. The margins of the bladder opening (1) are pared off and the fistula closed with buried sutures. The vaginal opening (4) is closed with catgut; the uterine portion of the fistula (2–3) is left to close by granulation.

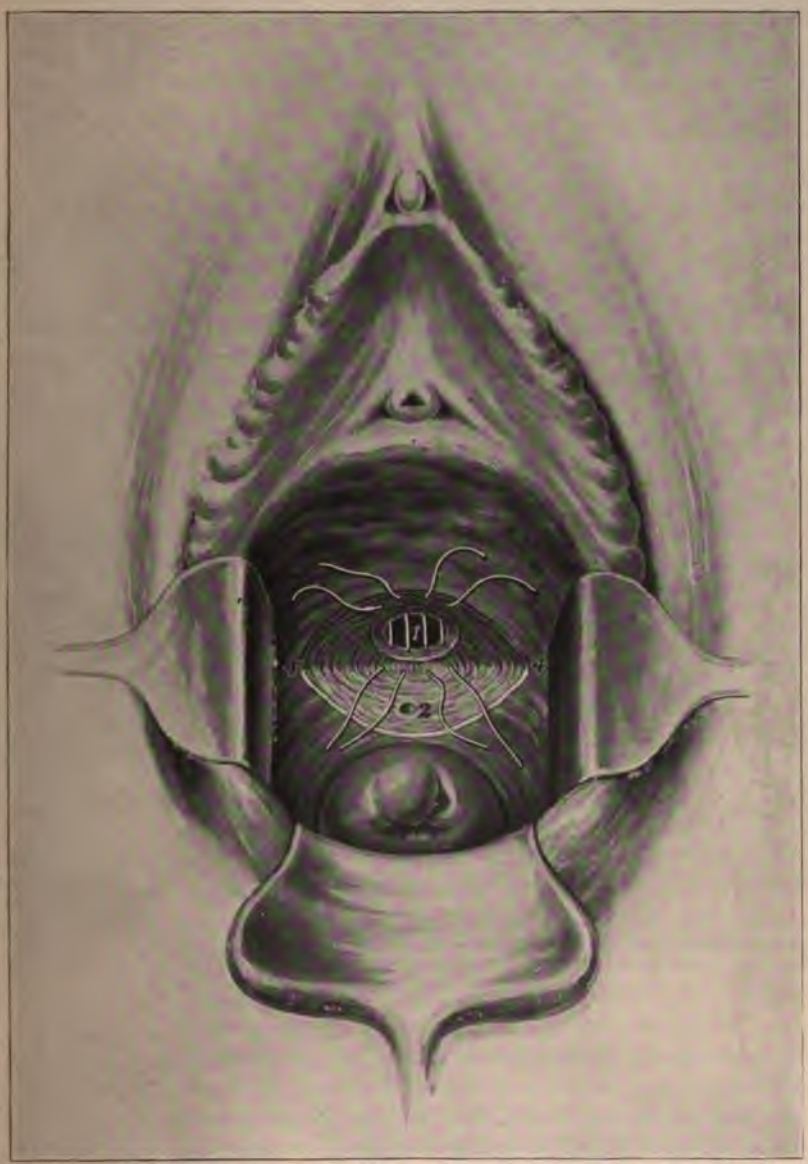
(*b*) THE SUPRAPUBIC EXTRAPERITONEAL OPERATION.—The suprapubic extraperitoneal method was employed by Leopold (case reported by Jacob Rosenthal[1]), modifying Trendelenburg's operation for vesicovaginal fistula.

He made the transverse incision just above the pubic bone and opened the bladder through an extraperitoneal incision. The fistula

[1] American Journal of Obstetrics, March, 1895, p. 321.

was high up on the right side of the bladder, communicating with the uterus posteriorly and the symphysis anteriorly. Finding direct sutur-

FIG. 90



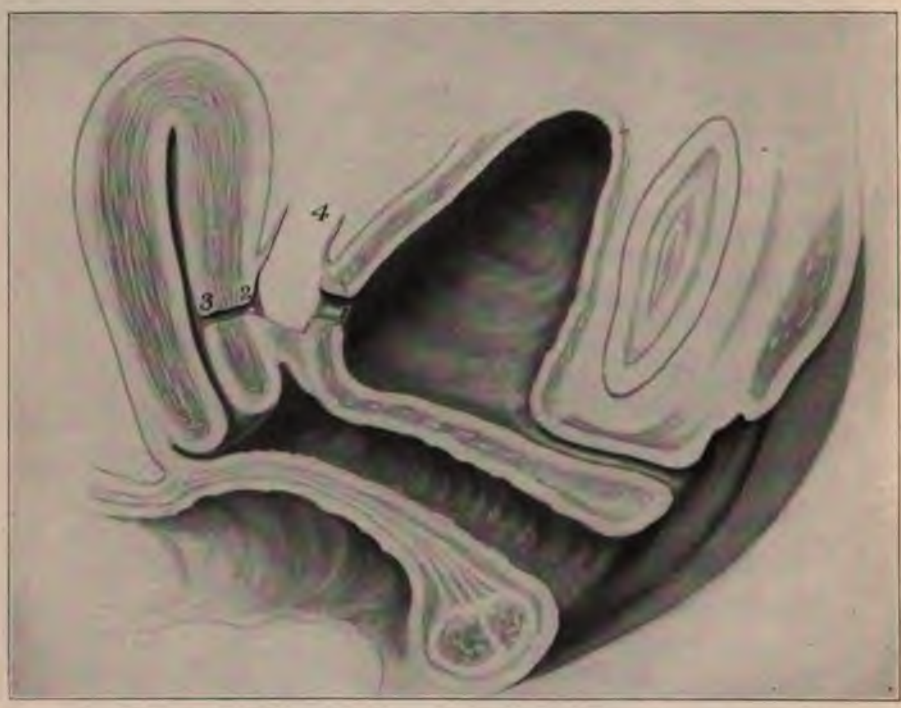
Anterior view of Fig. 89. 1, bladder opening after introduction of sutures; 2, uterine opening; 4, extremities of vaginal incision.

ing of the edges of the fistula impracticable, he resected that part of the bladder with the opening and closed the wound below the fistula, thus

excluding it from the bladder altogether (Fig. 93). Fine silk was used in suturing the bladder wound, and an iodoform gauze drain inserted.[1] This operation is useful when there is much destruction or infiltration of bladder walls, the latter occurring in connection with perivesical suppuration and extravasation of urine.

(*c*) COURANT'S OPERATION OR SUPRAVAGINAL HYSTERECTOMY.—Courant reports a case of vesicouterine fistula coexistent with vesicovaginal fistula. The latter was exceedingly difficult to close on account

FIG. 91



Vesicouterine fistula. Transperitoneal operation. The uterus and bladder are separated by an incision through the peritoneum (at 4), extending deep enough to cut the fistula in two parts. The straight line shading shows parts removed in paring vesical opening (1). (After Kelly.)

of constriction of the vagina; however, it was successfully done, but after a period of quiescense the flow of urine again appeared. On careful examination a vesicouterine fistula was found. He thought the patency was due to inability of the urine to escape through the small uterus, but as it grew larger obstructions were overcome.

As the fistula was inaccessible through the vagina he did an ordinary Porro operation (supravaginal hysterectomy) regarding it as an effectual

[1] American Journal of Obstetrics, March, 1893, pp. 324, 325.

means of disposing of the uterine end of the fistula.[1] Removal of the uterus then enabled him to close the edges of the bladder opening with much less difficulty.

COE'S OPERATION.—In a case in which he had previously amputated the body of the uterus, Coe removed the cervical stump, thus leaving nothing to close but the bladder opening and edges of the vagina. This doubtless was a valuable improvement in the technique

FIG. 92

Vesicouterine fistula. Transperitoneal operation. The vesical opening (1) is closed with buried sutures between 1-2, and the peritoneum sutured with catgut (4); the uterine portion of fistula (2-3) left undisturbed. (After Kelly.)

for such cases, for it added greatly to the working space and facilitated manipulations.[2]

(*d*) PAN-HYSTERECTOMY.—In very bad cases where the appendages are destroyed by inflammatory process and uterus and bladder fixed in the pelvis, making vaginal operation difficult, I would go farther and by combining Coe's and Courant's operations, as Mackenrodt did

[1] American Journal of Obstetrics, 1894, p. 358.
[2] Kelly. Operative Gynecology.

in ureterouterine fistula, do hysterectomy, for the uterus is then a useless organ. An operation of this kind relieves the complicated condition in the pelvis and makes closure of the bladder lesion much easier.

(*e*) HYSTEROCLEISIS.—As a last resort hysterocleisis may be performed. This is done by paring off the cervix around the external os and completely closing the latter with silkworm-gut after the manner of trachelorrhaphy. This operation has the objections of sterility and bladder irritation during menstruation, but these are not as serious as a urinary fistula.

The after-treatment for these operations is the same as for vesicovaginal fistula.

FIG. 93

The inflamed and softened portion of the bladder about the fistula (*I J K*) was resected and the edges of the wound in the bladder closed with silk. Suprapubic, extraperitoneal incision.

Dangers.—Except for the liability to infection of the uterus, Fallopian tubes, and to peritonitis, the dangers are little more than in vesicovaginal fistula operations.

Ureterovaginal Fistulæ. Definition.—A ureterovaginal fistula is an abnormal communication between the ureter and vagina through which urine is discharged into the latter. It is not of common occurrence, a comparatively small number of cases only having been reported.

Causes.—Before hysterectomy was a common practice, forceps deliveries and deep lacerations involving the cervix and ureters were the most frequent causes, but now they are more often ascribed to surgical

injuries, especially vaginal hysterectomy. They attend operations done upon parts in close proximity to the ureters, the removal of fibroid tumors of the uterus, ovarian tumors, etc., particularly when either ureter is much displaced by a growing neoplasm. Leakage after primary resection, implantation, and anastomosis of the ureter is not uncommon.

They follow extensive sloughing from pressure of the fetal head in childbirth, injuries inflicted in puncturing pelvic suppurations (R. Condamin), ulceration from calculus[1] impacted in the ureter (Cabot), tuberculosis of the ureter,[2] and foreign bodies in the vagina (Weil[3]).

The ureters may be injured in operating for vesicovaginal fistula, especially if the lesion follows complete removal of the uterus. The ureters then are not infrequently drawn closer together by contraction of the scar, and as the fistula is located deep in the vagina in these cases the ureters are liable to injury. A collaborator of mine caused double ureteral fistulæ in a case of this kind. (See case of Mrs. Goldberg, noted below.)

In repairing vesicovaginal fistula caused by pressure necrosis, injuries of the ureters most frequently occur in the region of the trigonum; this is due to the proximity of the fistula to the ends of the duct.

Ureteral fistula may also be congenital, due to failure of the Wolffian duct to separate from the duct of Müller; that part of the former forming the ureter therefore empties into the vagina, etc., forward from the latter[4] (Fig. 94). These defects are associated with other abnormalities of the genitourinary apparatus, especially the external genitals.

FIG. 94

Ureter terminating in the urethra. Guy's Hospital Museum, No. 1689. (Morris.)

Location.—When traumatic they are nearly always found deep in the vagina by the side of the cervix or in the scar made by hysterectomy, but may occur nearer the trigonum.

Ordinarily but one ureter is involved; in that case there will be but one opening, but if both are implicated, two openings will be found, unless it occurs as a result of double section and retraction of the ureters. Then both of them discharge urine into the subperitoneal space, resulting in urinary

[1] Cabot give an account of a uretera calculus ulcerating through into the vagina. American Journal of the Medical Sciences, 1892, cii pp. 43-54 To this may be added one of my own causing recurrence of fistula

[2] Morris and Ferguson report cases of tuberculous origin. Morris, vol. ii. p. 502; American Journal of Obstetrics, May. 1898, p. 629

[3] Weil describes a case where a Meyer ring pessary ulcerated through the vaginal wall deep enough to open the lumen of a ureter. Cent. f. Gyn., Leipzig., 1893, xviii. 17, from Wien. med. Woch., 1892, No. 16.

[4] Henry Morris. Surgical Diseases of the Kidney and Ureter, vol. ii. p. 502.

pockets just above the upper extremity of the vagina. Such pockets may communicate with the vagina through a single opening and lead to error in diagnosis. A case of this kind came under my observation.

Geyl[1] reports an exceptional case with one ureter opening into the vagina, the other into the uterus.

Congenital cases open in the lower part of the vagina, in the urethra, rectum, or upon the external genitals and skin surface. The opening is most frequently found near the meatus, on one side or a little below it.[2]

Cases of congenital fistulæ have been reported by Shaheyron,[3] McArthur,[4] Baker[5] and others.

Diagnosis.—The diagnosis is not difficult. It may be distinguished from a small vesicovaginal fistula by the use of a ureteral catheter. If the instrument enters the bladder it may be seen through the cystoscope or felt by a sound in the bladder; the fistula is then known to be vesicovaginal. But if the catheter cannot be seen or felt in the bladder, and slips deeply into the fistula, it must be ureteral. Injections of colored fluids into the bladder will escape through vesicovaginal fistulæ, but cannot effect the flow from ureteral fistulæ.

The method of comparison may be tried. The urine should be drawn completely from the bladder; the patient then instructed to sit over a vessel to collect the urine discharged from the vagina in a given length of time. It is then compared with that which collects in the bladder during the same sitting. If the two specimens are about equal in quantity or if they differ materially in character, that is, one contains pus when the other is free, it is evident that one ureter is emptying its flow into the vagina. If no urine collects in the bladder, vesicovaginal fistula is assumed, the exception being double ureteral fistula or unilateral kidney.

Congenital fistula is distinguished by the history of the case; they exist at birth, while traumatic fistula dates from a definite period later in life. Congenital fistula opens low down in the vagina, below the neck of the bladder, and as far externally as the meatus, and shows no signs of scars about the terminal orifice.

The cases liable to be overlooked are combined fistulæ (*a*), ureterouterine with ureterovaginal; ureterovaginal with vesicovaginal, and either of these with a congenital fistula (*b*) terminating in the urethra or rectum. Confusion may also be caused by regurgitation of urine through the vesical stump of a severed ureter. This has been observed by Hartmann and Desuas: (*a*) In the combined fistulæ, unless great care is observed in searching for this particular condition, the true status of affairs may not be known until after successful closure of one opening; then continuous leakage will excite suspicion. (*b*) Diag-

[1] Volkmann's klin. Vort., 1892, No. 37.
[2] Geyl. Volkmann's Sammlung. klin. Vort., 1892, No. 37.
[3] Archiv. de Tocol, Paris, 1889, p. 254.
[4] Medical and Surgical Report, Philadelphia, 1898, p. 225.
[5] New York Medical Journal, 1878, p. 575.

nosis of the ureterourethral form will not be made until the child has reached an age when it should control its bladder, then the urine will be seen to drip from the urethra. By negative diagnosis other fistulæ and inflammatory diseases, preputial and hymeneal irritations exciting reflex neurosis about the meatus can be excluded.

In older persons who can control the bladder, colored fluids may be injected into it, taking care not to stain the urethra. The patient should be instructed to retain the fluid, then if clear urine continue to drip from the meatus and the colored fluid does not return the diagnosis is established. The urethra should then be examined under general anæsthesia to determine the exact location of the opening.

Prognosis.—Aside from the annoyance and repulsiveness of the urinary discharges, excoriated vagina and external genitals, the danger lies in the liability of ascending ureteritis, nephritis, etc. The danger is greatest in uncleanly persons and suppurative process existing near the false opening leading to infection of the ureter and kidney. Persons with this affliction have been known to live a number of years, but the tendency is to shorten life materially.

Dangers of the vaginal operation are about the same as for vesicovaginal fistula, but with a greater tendency to peritonitis and extravasation of urine.

Congenital fistulæ seem not to be so prone to infection, due presumably to absence of less extensive suppurations in the immediate vicinity of the terminal ureteral opening, but they are not entirely exempt from infection of the ureter primarily and the kidney secondarily.

Treatment.—Congenital fistula having an unbroken mucous lining requires surgical relief.

Traumatic fistula and those due to inflammatory process sometimes heal spontaneously. R. von Braum-Fernwald,[1] C. C. Frederick,[2] A. T. Cabot,[3] Zweifel, Gusserow, Hann, Tuffier, Lavisé and Gallet[4] and others have reported cases. To these I will add two of my own.

Frederick's first case recovered in eight months after receiving the injury. His second case had periods in which the flow was interrupted, the intervals gradually growing longer until they ceased altogether.

One of my cases was caused by formation of calculus around silk sutures used to implant the ureter in the bladder. The stone escaped into the vagina but the fistula closed in a few weeks.

Vernuel[5] claims there is a tendency to contraction of the ureteral openings, resulting in hydroureter and hydronephrosis. This has been proven by Polk and others in this country, and, therefore, it is very likely a factor in cases of supposed spontaneous cure.

Among such cases reported there were symptoms of hydronephrosis, with pain, swelling, and tenderness of the kidney. So it is a question

[1] Trans. Obst. and Gyn. Soc. of Vienna, October 26, 1897.
[2] American Journal of Obstetrics, November, 1901, p. 674.
[3] American Journal of the Medical Sciences, 1892, ciii. pp. 45–54.
[4] An. de la Soc. Chir. de Brussels, 1891; Morris vol ii. p. 511.
[5] Morris. Surgical Diseases of Kidney and Ureter, vol. ii. p. 607.

if some of them in place of being cured did not lead to atrophy of the kidney from obstruction of the ureter by granulation and cicatrization, or by calculus. This was particularly noticeable in the cases referred to as well as Boldt's.[1] In Cabot's case the kidney was destroyed by calculus. Mine, however, was an exception.

If the lesion of the ureter is lateral such as may be produced by pinching with a clamp or puncture with a needle and partial ligation, spontaneous cure is more likely to take place, as there is left the natural outlet into the bladder for the urine to escape. Stoeckel seems to think that spontaneous cures are probably confined to this class of cases.[2]

Operation.—There are several methods of operating:

1. Abdominal implantation of ureter in the bladder.
2. Vaginal implantation of ureter in the bladder.
3. Splitting the end of ureter, making an opening for urine to escape in the bladder, and closing the vaginal side of the opening.
4. Implanting the fistula with a patch of vaginal mucosa surrounding it in a button-hole in the bladder.
5. Turning the upper extremity of the vagina, containing the fistula, into the bladder.
6. Colpocleisis.
7. Nephrectomy.

Selection of the operation best suited to each individual case requires a degree of familiarity that only comes by experience. A skilful operator may be successful with suprapubic implantation where another may be bungling, especially if he does not possess an accurate knowledge of the relations of the ureter. This, however, is largely compensated for by the use of ureteral bougies placed in the ureter before the abdomen is opened.

Again, vaginal operations are tedious on account of the location of the fistulæ deep in the vagina, and in many cases the technique fails for a want of deftness in handiwork. But it is less serious, and, therefore, most European operators claim it should be given preference over the abdominal, other things being equal.

In this country preference for the abdominal operation is fast gaining ground, and I find my own inclinations are in that direction, since two cases cured by the vaginal operation reopened a year later. One of them closed spontaneously and the other seems to be healing.

In deciding this question the danger of the abdominal operation must be weighed against the liability to failure and recurrence after vaginal operations.

Causes of recurrence in these cases are return of malignant disease, dilated ureters and pockets in which calculi frequently form and are liable to ulcerate through and escape into the vagina, also extravasation of urine in bad cases.

The great difficulty is in positively determining whether the healthy

[1] American Journal of Obstetrics, 1896, p. 847.
[2] Am. Gyn., 1896, p. 847

ureter connects directly with the vagina or whether there is a pocket between the vagina and the end of the ureter. If the first condition exists vaginal operation will be eminently satisfactory, but otherwise abdominal operations give better results, provided the physical condition of the patient justifies the method.

In no case should a vaginal operation be done very soon after reception of the injury producing the fistula, as new scar tissue and urinary or pus pockets are unfavorable fields for plastic work. It is better to either adopt the abdominal route or delay the vaginal operation until nature is given a chance to heal such places as far as she can.

When the end of the ureter has retracted and is connected with the vagina by a fistulous tract more or less tortuous and dilated, or if a urinary pocket is situated between these two points it is not good surgery to transplant the urinary opening (communicating with the vagina) into the bladder, for the urine and débris will collect in the dilated parts of the false canal and lead to formation of calculi. Closure of such pockets before they are properly healed or lined with epithelium are even more disastrous. In these circumstances they are nothing more than pus pockets, and connecting them with the bladder mechanically interferes with drainage, induces fermentation, ulceration, and extravasation of urine. Fortunately, the latter nearly always extends to the vagina and reopens the pocket, but it may take a less fortunate direction and result in serious destruction of tissue.

These cases should be thoroughly drained into the vagina and kept open by antiseptic treatment until they are practically healed or lined with epithelium, or the patient sufficiently recovered to withstand the trying ordeal of abdominal operation.

The latter operation for this condition can be done earlier than the vaginal, for the reason the ureter may be disconnected from the pocket and anastomosed in an aseptic field.

1. ABDOMINAL IMPLANTATION is described in the chapter dealing on that subject.

2. VAGINAL IMPLANTATION implies a similar operation done through the vagina. This consists in dissecting the ureter from the scar tissue in the vault of the vagina and rendering it freely mobile that it may be drawn down to a point of easy access, then the bladder may be opened and the ureter anastomosed to it.

In dissecting the end of the ureter free, I find it expedient to make a curved line, beginning on the upper side of the fistula, then turning around the outer side and terminating at a point below the fistula, thus a horseshoe incision is made with the fistula in the centre of it, the toe of the shoe being directed to the outer side.

The advantage of this is that the operator gains access at once to the cellular space between the bladder and vagina, and the ureter can be released with much more facility than if attacked through the scar tissue.

After cutting through the vaginal wall the finger is pushed into the fatty tissue to the outer side of the ureter and gentle separation of the

bladder all around the ureter is effected. The finger then traces the ureter upward along its course, which is made easy by the bougie previously inserted into it, and if the uterine artery has not been destroyed or displaced by a previous operation it will be found crossing the ureter a short distance behind the bladder. The ureter is liberated on its inferior surface first, then it is separated from the uterine artery by the finger, making downward pressure as it separates the duct in a side-to-side motion. In this way the ureter is pushed away from the artery.

Should the ureter be fixed in an hysterectomy scar it is easily liberated when working from above downward; that is, first separate the bladder by cutting transversely in normal mucous membrane above the scar and then begin in healthy tissue under the peritoneum and separate the scar with the finger working in the direction of the vagina. Dense bands of scar tissue require cutting.

When the ureter has been sufficiently liberated to reach the bladder without tension the technique of the suprapubic operation is employed in anchoring its end in the bladder, or a ten-day chromicized catgut may be used as a tension suture to fix the end of the ureter. The bladder walls may then be closely sewed to the ureter by fine silk sutures, three to four being ample. These sutures should take a firm hold, but must not penetrate the mucous membrane of either, therefore the needle will pass through a wide section of tissue, about one-fourth of an inch in place of penetrating deeply. If the wound in the bladder does not fit closely around the ureter when these sutures are tied, excess of the incision must be accurately sutured to make a water-tight joint. Further protection may be given by suturing or turning a fold of bladder wall from each side over the ureter and stitching them together, forming a collar-like arrangement just behind the point of entry in the bladder.

The margins of the vaginal wounds should then be closed by deep silkworm sutures, care being observed to leave no dead spaces. If there is a tendency to formation of such space the subperitoneal fatty tissue should be drawn into the wound with tissue forceps and included in the vaginal sutures.

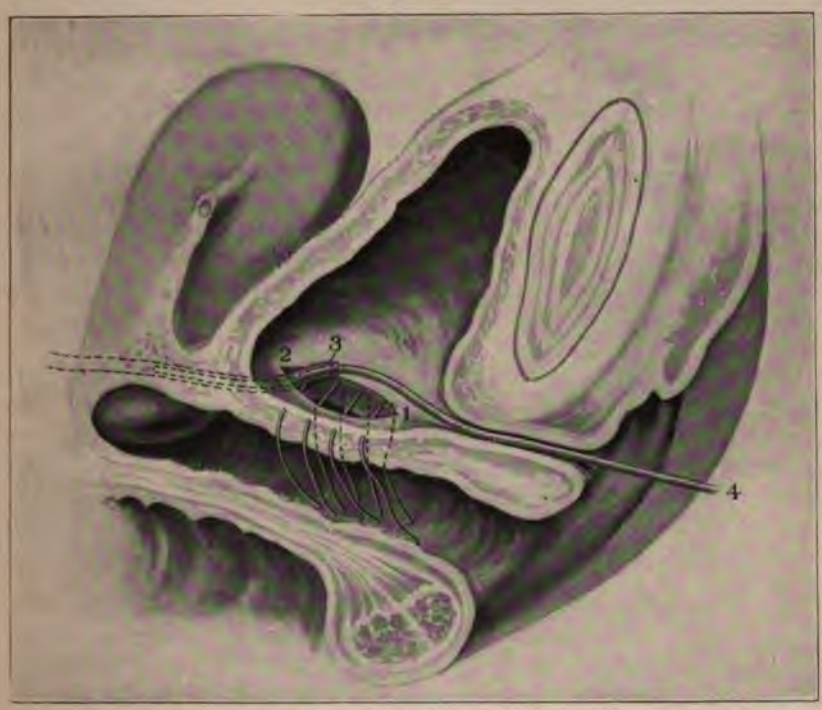
Landau's Operation.—This operation is suitable only to cases in which the fistula is situated low in the vagina or close to the edge of the vesicovaginal fistula. When located high up by the side of the cervix it is difficult to execute.

If a vesicovaginal fistula is present, Landau pares off its edges, according to the classical operation, then passes a ureteral catheter through the urethra into the bladder, then through the vesicovaginal fistula into the ureteral opening. In this way the end of the ureter is turned into the bladder. If it does not project within the vesical mucosa the end of the ureter is liberated by making an incision along its course, starting at the external opening. The incision should pass through the septum, severing both the vaginal and bladder walls; the ureter is dissected free, and a short section of its lower end projected into the bladder (Fig. 95). It is held in position by the catheter and the vaginal

and bladder wall closed after Sims' method, taking care that the sutures do not surround the ureter, but pass below it on the vaginal side. The catheter is left in position from five to seven days to prevent the end of the ureter from retracting within the edges of the wound in the vesicovaginal septum.

3. Splitting End of Ureter.—Simon, of Germany, and H. F. Campbell, of Georgia, were among the first to adopt this method. It is not applicable to deep-seated fistula by the side of the cervix, or in old hysterectomy scars. The danger in such cases is in opening the sub-

Fig. 95



Landau's operation. An incision (1–2) is made in the median line of the bladder, back as far as the ureterovaginal fistula. The ureter is then liberated by free dissection, and its end (3) drawn into the bladder and held in position with a ureteral catheter (4), which is passed through the urethra and into the ureter. The incision is then closed with silkworm-gut.

peritoneal fatty space and extravasation of urine. But lower in the vagina or near the trigonum it is an easy procedure.

As Campbell describes the operation it must be simple and of easy execution. He splits open the end of the ureter, cutting into the bladder for about 2 cm. This allows for some contraction without ultimate obstruction of the ureter. The vaginal wall is then pared off and closed with silver wire sutures after Sims' method for vesicovaginal fistula.

The split portion of the ureter is left open on the bladder side for the escape of urine into the bladder.

Simon did this in two operations, first splitting the end of the ureter for three-fifths of an inch on the bladder side, and kept the edges from healing by the daily use of a sound; later he closed the vesicovaginal fistula.

Dührssen modified the operation by stitching the mucous membrane of the split ureter to that of the bladder to prevent contraction, and used the ureteral catheter as suggested by Landau.[1]

4. Implantation of the Fistula with a Rim or Flange of Vaginal Mucosa around it in the bladder has been substituted for implantation of the ureter on account of the difficulty of separating the latter from an hysterectomy scar, or when it is located close by the side of the cervix.

Schede's Operation.—Schede made a button-hole in the bladder over the fistula, removing about four-fifths of an inch of vesical mucous membrane, then stitched the mucous membrane of the bladder and vagina to prevent its closing. After this he denuded a ring about half an inch wide around the ureteral opening, leaving a small patch of mucous membrane, 3 or 4 mm. in diameter, and made a corresponding raw surface around the opening in the bladder. When the raw surfaces were stitched together it turned the ureteral opening into the fenestra previously made in the bladder, thus a gutter-like depression was made in the septum leading down to the original fistula.

Another method is executed by liberally paring off the mucous membrane of the vaginal vault for a distance of half an inch or more all around the fistula, but leaving a patch of mucous membrane surrounding the fistula. This patch of mucous flange should be from one-half to three-fourths of an inch across. A transverse incision is then made into the bladder. It should be immediately over the fistula and extend from side to side of the vagina its full limit; a shorter incision is difficult to work in.

No. 1 plain catgut sutures are used to approximate the edges of the bladder mucosa to the rim of the vaginal mucous membrane around the fistula. This may be a whipstitch, inserting the needle three-sixteenths to one-quarter inch back from the margin. The first stitch should be made in the upper angle to the left of the operator. The posterior flap of vesical mucosa should be drawn well down in the wound with a pair of long tissue forceps, and after the needle is passed through the extreme left hand angle it is released and the corresponding part of the island of mucous membrane about the fistula is seized with the tissue forceps and pulled well forward in order to make room for the introduction of the needle in the denuded surface; it is then passed through the flap from behind, forward; when tied both ends of the suture are left long for the purpose of tying the final knot when the circuit of sutures around the fistula is completed.

[1] E. v. Bergmann, vol. v. p. 379.

After the first stitch is tied tension upon the sutures will bring both margins into the wound and facilitate introduction of the remaining stitches. The vaginal margins should then be closed with silkworm sutures after the classical method.

Ferguson used interrupted sutures tied on the bladder side, leaving the ends long, bringing them out through the urethra for the purpose of removal after separation. He closes the vaginal wound in the usual way.[1]

FIG. 96

Hahn's operation. 1–2, transverse incision of vesicovaginal septum; 3 *B'*, denuded surface in vagina; *A A'*, sutured together with continuous stitch; *B B'*, sutured to raw surface in vagina, *B'* 3, with silkworm-gut. (See Fig. 97.)

In my hands the best results have been obtained with the submucous stitch used for the purpose of approximating bladder mucosa to the mucous collar around the fistula.

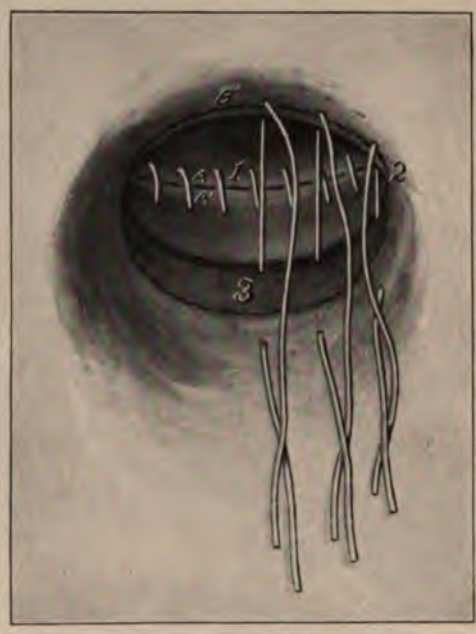
5. TURNING THE UPPER EXTREMITY OF THE VAGINA CONTAINING THE FISTULA INTO THE BLADDER.—This method is beautifully illus-

[1] American Gynecological and Obstetrical Journal, May, 1898, p. 632.

trated by Kelly.[1] It is Hahn's operation slightly modified. In place of denuding around the fistula a transverse incision is made across the vagina as shown by the dark line 1 to 2 (Fig. 96).

A short, curved male urethral sound is passed through the urethra and the base of the bladder and at a point directly over the fistula is depressed by turning the tip of the sound downward and a little forward, and held firmly in position by an assistant. Use a pair of broad, sharp-pointed scissors in cutting down upon the sound, making the opening large enough to admit a finger before removing the instrument.

FIG. 97[2]



Same as Fig. 96. Cross-section looking through the vagina.

Utilizing the finger as a guide the incision is extended laterally to the sides of the vagina the full limit. Bleeding is trifling and rarely requires ligatures.

The vesical margin *A* is stitched to the vaginal margin *A'* by a whip-stitch. Then a broad strip (one-half to three-quarters inch wide) is denuded transversely across the posterior wall of the vagina just below the fistula (Fig. 96, *3*). This strip extends from one angle of the incision to the other. After this the bladder margin *B* and the vaginal margin *B'* are stitched with silkworm-gut to the denuded strip designated by the number 3. This depresses a small section of the base of

[1] American Gynecological and Obstetrical Journal, January, 1898, p. 755.
[2] Ibid., June, 1898, p. 735

the bladder to the posterior vaginal wall, turning the small portion of vaginal mucosa containing the fistula into the bladder.

The operation is very satisfactory and does not tend to formation of pouch or pocket in which calculi are apt to grow unless the transverse incision is much too short or made too low in the vagina. The operation has been adopted by Kelly, X. O. Werder and other American surgeons.

FIG. 98

Same as Fig. 96 with sutures in place.

In place of the continuous sutures I feel sure that stitching the margin *B*-2 to 3-2 with a submucous stitch has served me well in making close approximation and preventing leakage (Figs. 97 and 98).

Not infrequently considerable difficulty is experienced in closing the vaginal wound, especially when inserting the silkworm sutures in its angle. To obviate this I have found the denudations at the angles may be turned downward on the side of the vagina, forming a curved or more or less horse-shoe shape, the ends of which are very much easier to close.

6. COLPOCLEISIS.—Colpocleisis is no longer regarded with favor for uterovaginal fistula. It must be a very much complicated case that demands such measures. Aside from malignancy one thing only will likely suggest its use, that is a marked stenosis or partial atresia of the vagina when vaginal operations are impracticable; even then abdominal anastomosis of the ureter is indicated.

The objections are the loss of the vagina and the certainty of diseases of the kidney, uterus, and Fallopian tubes that follow in the course of time, when the menses discharge into the bladder.

7. NEPHRECTOMY.—For some years after removal of the kidney by Simon, 1869, nephrectomy was done more often than any other operation for this trouble, but since the technique of ureteral anastomosis has been so much improved it is employed only as a last resort. It is permissible when the kidney of the injured ureter is seriously diseased and the opposite one healthy.

When the ureter is cut too short for anastomosis and the opposite kidney is healthy, or if the ureter is extensively destroyed by calculus ureteritis or much involved in malignant disease of other organs, it becomes an open question whether nephrectomy is preferable to intestinal anastomosis on account of secondary infection and final removal of the organ. Does the short respite from urinary leakage repay for the distress and suffering incident to colon bacilli infection and a second operation? I think not, for one healthy kidney is ample to sustain life, and the ultimate results of anastomosis of the ureter into the intestine have been so discouraging the operation has gained but little favor.

In addition to the above-mentioned methods of operating many other plans have been tried with indifferent success.

Baumm, Bazy,[1] and Albarran[2] did the transvesical operation by cutting into the bladder above the pubic bone, then making a small opening in its base, into which the ureter was drawn and fixed by sutures. This route was adopted because both cases were young girls. They do not recommend the operation as an elective one.

Zweifel attempted to make an artificial ureter to replace the section lost but failed.[3] Emmet was more successful, and McGannon, of Nashville, succeeded perfectly in building of vaginal mucous membrane an artificial canal from a ureteral fistula near the cervix to a small vesicovaginal fistula near the trigonum.[4]

DESTRUCTION AND RESTORATION OF THE URETHRA.

Destruction of the urethra is not of very common occurrence, and operations for its restoration are less frequent. It is often due to some ulcerative process, especially in syphilitic subjects, also to prolonged pressure in childbirth, removal of tumors, malignant growths, and other surgical injuries.

[1] Henry Morris, vol. ii. p. 571. [2] Ibid., vol. ii. p. 572. [3] Pozzi, vol. ii. p. 329.
[4] American Gynecological and Obstetrical Journal, May, 1891, p. 391.

Clinically it should be divided into two general classes: one without injury to the constrictor muscles of the urethra and neck of the bladder, the other with partial or total loss of these muscles.

In the first class building of an artificial urethra is attended with continence of urine; with the other class it is either not secured or the power of retention is mechanical. The urine in the latter instance dribbles away when the bladder becomes distended or the obstruction is so great micturition is impossible, and catheterization becomes a necessity.

The paraurethral tissue is limited in extent, consequently there is little opportunity for restoring the canal after much loss of tissue; the cicatrix clings so closely to the pubic arch and its vitality being low, failure nearly always results.

Treatment. LEGUE'S OPERATION.—Many attempts have been made to perfect some form of flap operation. For instance, Legue[1] cut them from the side of the vagina, vaginal orifice, and nymphæ, making the incision on each side low enough to secure sufficient tissue to stitch over a sound or catheter. The edges of the mucous membrane were first brought together with buried catgut and the thicker portions of the flaps closed with a separate row of sutures.

The principle of this operation is apparently good, but few cases only are primarily successful, and many of them subsequently open when contraction of the cicatrix occurs. The tension thus produced decreases the vitality of the tissue and leads to secondary ulceration.

Emmet's experience is, perhaps, more extensive than any other surgeon, yet he has been so discouraged as to announce his intention never to do the operation again.[2]

In the first class of cases, when the tissues under the pubic arch are not badly destroyed, flap splitting by making an incision along the edges, or remains of the urethra on either side, turning the superior flaps into the urethra and securing the lower ones by mattress sutures inserted as deep as the centre of the incision was successful in a case of mine. But I will add that I drain this class of urethral work through a vesicovaginal fistula to give the parts rest and to prevent urinary infiltration.

PRINGLE'S OPERATION.—J. Hagarth Pringle,[3] of Glasgow, succeeded in transplanting a section of the urethra of the bullock into male subjects five different times, but it does not appear that any attempts of this kind have been practised upon the female. It is a new experiment, but may possibly be useful in cases possessing retentive power of the bladder. But transplantation of animal tissue to the human subject is generally regarded as impracticable.

If the tissue under the arch has been badly damaged, transplantation of the flaps from the vulva is necessary, but they not infrequently require repeated operations to succeed.

[1] American Journal of Obstetrics, March, 1897.
[2] Ibid., February, 1901.
[3] Annals of Surgery, September, 1904, p. 387.

C. P. Noble's Operation.—C. P. Noble has employed the nymphæ for this purpose, with a degree of success. He describes a successful operation in the *American Journal of Obstetrics*, February, 1901. This patient had eleven operations, three of which were done by Dr. Noble. In his first attempts he endeavored to take flaps from the side of the vaginal orifice and vulva, but succeeded in temporary relief only. In the third operation he denuded the tissue under the pubic arch thoroughly, leaving only a small strip of mucous membrane running back to the bladder opening, then pared off the posterior surface of the labia minora of the left side and stitched it to the edges of the strip left beneath the pubic arch, making approximation with buried sutures. The outer edges of the labia were firmly tacked to the bladder and raw surface under the pubic arch by another line of stitches. The urethra was extended forward to a point just below the meatus. Noble thinks that the main feature of his operation consisted in making a very small urethra, using as a guide a sigmoid catheter about one-third the usual size.

McArthur adopted a very similar method. Freund and Newman turned the uterus through an opening in Douglas' pouch and stitched it to the base of the bladder. The cervix was turned into the bladder and an opening made in the fundus so urine could enter the cervix and escape through the perforation. The technique can be found in the chapter on vesicovaginal fistula.

In the second class of cases the constrictor muscles of the urethra and neck of the bladder should be carefully sought for, and the ends joined with buried chromic or silk sutures before the new urethra is made. The mucous membrane of the bladder and new urethra should be carefully united to prevent exposure of these stitches.

It has been my belief that closing over a catheter is a mistake, for the constrictor muscle cannot be drawn close enough to hold urine if the parts are held open by an instrument. On the contrary, the muscle must be drawn closer together than permanently necessary. If they are not made water-tight at the time of the operation they will not be afterward. It is even better to be on the safe side and make them too tight, to allow for subsequent stretching of the scar between the ends of the muscles.

In a case of this kind, in which the bladder opening was large enough to admit the tip of my finger, I succeeded in securing continence by closing the bladder almost completely with buried chromic gut. After securing the constrictor muscles, a triangular vaginal flap was made with the apex at the bladder opening and the two incisions extending upward and outward into the anterior vaginal sulci for a distance of one and a half inches. The flap involved the trigonum and extended back nearly to the ureteral opening in the bladder. The tissue under the pubic arch was trimmed away, except a narrow strip of mucous membrane, one-fourth of an inch wide, extending back to the bladder.

The tip of the flap was drawn forward as far as the site of the normal meatus and anchored beneath the arch with mattress sutures of silk-

worm. They entered the tissues on the side of the arch just below the denuded surface, emerged from the latter one-fourth of an inch to the outer sides of the mucous strip running back to the bladder, then entered the flap deeply, but not going entirely through it, and returned to the reverse direction to a point one-half inch anterior to the place of entry. Two sutures of this kind were placed on either side; when tied they forced the flap snugly under the arch. The fifth stitch passed through the apex of the flap and completed the formation

FIG. 99

Von Grusdew's operation. *A F*, anterior flap; *P F*, posterior flap; *V V F*, vesicovaginal fistula; *R V F*, rectovaginal fistula; *N U*, new urethra.

of the meatus. The edges of the flap were left to take care of themselves, and drainage was secured through a vesicovaginal fistula.

I now have a second successful case of this kind in the Grady Hospital. Perfect continence was demonstrated when the fistula was closed.

SPINELLI'S OPERATION.—Spinelli[1] advocates colpocleisis with establishment of rectovaginal fistula when the constrictor muscles of the

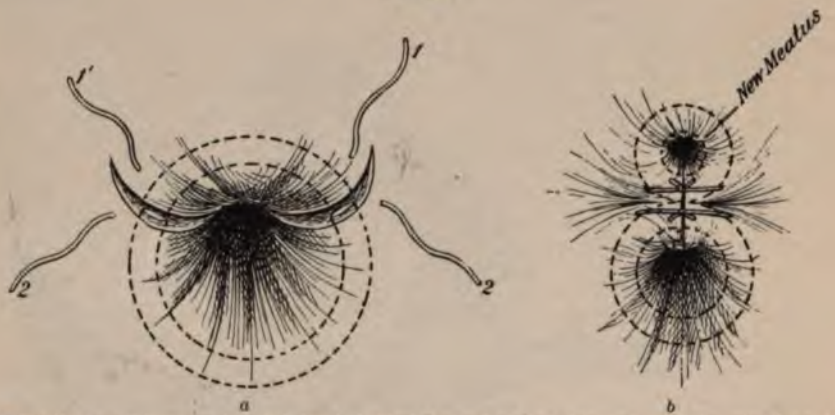
[1] American Journal of Obstetrics, August, 1894.

urethra and much of the bladder have been destroyed. He cites eleven cases and gives the history of the operation as far back as the original one done by Maisonneuve in 1852.

The urine is ejected with the feces every two, three, or four hours without irritation of the rectum. This operation exposes the patient to the dangers of fecal infection of bladder and kidney.

VON GRUSDEW'S OPERATION.—To overcome this von Grusdew[1] adds to the above procedure the construction of an artificial urethra in the rectum (Fig. 99). After dilating the anus he made a canal from the rectovaginal fistula to the perineum, the lower end of it being under the control of the sphincter ani muscle; continence of urine was secured.

FIG. 100



Two silkworm sutures are inserted deeply behind the end of the sphincter muscle to unite the cut ends and make two new sphincters, one for the new meatus, the other for the anus.

Two incisions were made in the anterior wall of the rectum, including between them one-third of the circumference of the rectum. These lines extended from the skin of the perineum upward around both sides of the rectovaginal fistula to meet at a point between 2 and 3 cm. above it. The knife cut through the mucous membrane to the submucous layer and divided the external sphincter ani muscles in two parts (Fig. 100 *a*). The edges of the flaps were liberated sufficiently to meet over a bent glass tube (which was placed in the fistula), and secured by catgut sutures carefully placed so as not to pass through the mucosa into the lumen of the new urethra. Another row of buried sutures brought the deeper parts of the flaps together.

The rectum was then sewed together over the newly made urethra, giving special attention to deep stitches in the external sphincter for the purpose of approximating its cut ends, thus making two separate sphincters: one for the anus, and the other for the urethra (Fig. 100 *b*).

This is an ingenious but difficult operation, subject to failure or repeated attempts before success can be secured. It lacks thorough

[1] Cent. f. Gyn., August 30, 1902.

testing and approval. Besides this, I have known loss of one-third of the sphincter ani muscle to result in serious inconvenience by constricting the anus. Von Grusdew succeeded in three sittings: one for the colpocleisis, and two in constructing the new urethra. Both these operations have the objections pertaining to colpocleisis.

CHOICE OF OPERATION.—When the constrictor muscles have not been destroyed building of an artificial urethra is indicated mainly to prevent discharge of urine into the vagina.

When the muscles are partially or completely gone, artificial urethra is preferable to colpocleisis if continence can be secured. If it cannot be done surgically the Kollisher pessary may be used to control the escaping urine. At least these attempts should be tried before the vagina is closed, unless the woman is unfit for marriage relations.

As a last resort implantation of the ureters into the rectum may be done. It subjects the kidney to infection, but does not have the objection of closing the vagina.

CHAPTER VII.

LACERATIONS OF THE PERINEUM.

By GEORGE H. NOBLE, M.D.

Anatomy.—The perineum proper embraces all those structures in the pelvic outlet anterior to a line joining the two ischial tuberosities. It is composed of muscular and fibroelastic tissue. Much of the latter is in the form of fascial membranes of great importance. In the female the perineum is pierced by two canals—the urethra and the vagina.

We are little concerned here with any part of the perineum except the so-called "perineal body," which is that wedge-shaped collection of tissue lying between the lower segment of the vagina and rectum. The thickness of the wedge at its base (on the skin surface) is from one and one-fourth to one and one-half inches.

It is convenient to describe the muscles entering into the formation of the perineal body as being disposed in two layers—superficial and deep. Those in the superficial plane are the sphincter ani externus, the two transversi perinei, and the sphincter vaginæ (bulbocavernosus). These all converge to meet at a central point rather nearer to the fourchette than to the anus known as the central perineal point. The upper muscular plane is formed by the deep transversus perinei and the levator ani, a muscle of the greatest importance in the formation of the pelvic floor. It is often described as being made up of the pubococcygeus and the puborectalis. The anterior fibres of the levator ani also join the muscles of the superficial plane at the central perineal point. This muscle is invested with fascia of considerable strength. On its superior surface (which also looks forward) is the rectovesical fascia; on its inferior surface is the ischiorectal fascia (deep pelvic). The anterior borders of the muscle, behind and lateral to the vagina where they can be distinctly felt, are free and here the two investing fasciæ become continuous with each other. It is also to be remembered that the fascia of Colles and both layers of the triangular ligament extend far enough backward toward the anus to constitute part of the perineal body now under discussion.

Lacerations.—By common usage the extent of lacerations are divided into three degrees. First, those involving the fourchette, mucous membrane, and submucous connective tissue down to the muscles. Second, tears extending through the perineum to the sphincter ani muscle. Third, complete lacerations in which the perineum is torn through into the rectum.

They take the direction of least resistance, following the course of

the fibres of the resisting fascia or muscles, but vary with the forces influencing the pressure exerted upon the parts, consequently many varieties are produced.

In variety they are commonly known as central and lateral; to these may be added irregular forms. Central tears are those occurring in the median line beginning in the posterior commissure and extending directly backward through the central tendon. They are not as frequent as other varieties and in most cases are confined to the first and third degrees.

FIG. 101

Perineorrhaphy. Bilateral laceration of the vagina, with central laceration of the perineum of the second degree.

Lateral tears are often so close to the median line as to be mistaken for them, but close inspection will show such cases either do not start in the posterior commissure or that they terminate at one side of the anus. Not infrequently lateral tears begin a little to one side of the vaginal orifice, near the posterior extremity of the labia, pass backward by the side of the central tendon, and skirt around the anus, or turn outward along the course of the fibres of the triangular ligament.

Such is the general direction when lacerations are single or simple in character. But not often they are multiple or complex. They may

extend deep into the pelvic floor, following the lateral sulci by the rectum on one or both sides, in the latter instance taking the shape of the letter Y, with the stem of the Y between the two sides of the severed perineum and the arms running up by the side of the rectum (Fig. 101).

In rapid delivery with great disproportion between the head and vulva the latter may be literally pushed off from the other constituent part of the pelvic floor and bones. The tear in such circumstances runs transversely across the perineum, turns around the vaginal outlet between the labia and rami of pubic bone in the direction of the clitoris, and may extend as far as the anterior commissure. They cause profuse bleeding in the region of the clitoris.

In exceptional instances sharp, presenting parts of the fetus have punctured the rectovaginal septum, affecting delivery through the anus,[1] or from similar causes the perineum may be torn through sufficiently to permit the passage of the child between the anus and ostium vaginæ.[2]

Lacerations may extend deep in the vagina, especially when due to unskilful use of forceps, disproportion, or in first labor occurring late in menstrual life. The lateral sulcus may be laid open in part or as far as the cervix, and extend deep enough to expose the internal obturator muscle. I saw an enormous tear of this kind when the levator ani muscle was torn across about its middle portion, and when the ends retracted the internal obturator was beautifully shown, its entire inner surface being exposed to view. The upper end of the tear in this case extended into the cervix uteri, the lower extremity passed through the perineum by the side of the rectum to the tip of the coccyx. The lacerated muscles were united with buried catgut sutures and the vagina closed with superficial sutures of the same material. Silkworm was employed in the perineum. Much to my surprise the parts united perfectly, despite the fact that on account of the surroundings the attending physician could not conduct the labor in a cleanly way, and that the vagina was packed with a soiled towel to control the frightful hemorrhage that ensued immediately upon delivery.

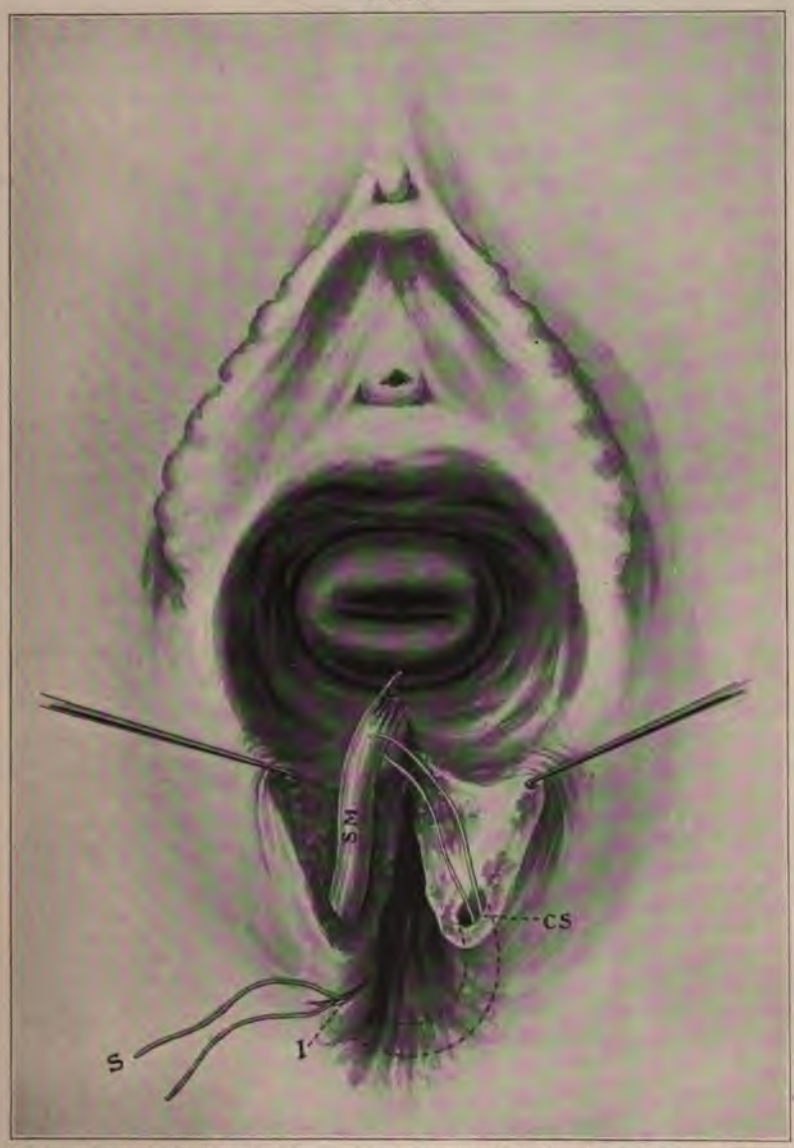
In complete lacerations passing through the anterior rectal wall the external sphincter ani is occasionally lacerated at a point posterior to the anus and a segment of the muscle is pulled out of its sheaths, producing the peculiar effect of a projecting muscle upon one side and an empty sheath on the other (Fig. 102). This occurred in three women to whom I was called to close primary tears, and one other requiring secondary operation.

A small percentage of extensive lacerations are complicated by frightful loss of tissue from sloughing or repeated operations, and it may become necessary to transplant or fill in the pockets by preliminary flap operations from the side of the vagina or labia before attempting closure. I refer to cases of great degree of rigidity and fixation of the

[1] Emmet. Transactions of the American Gynecological Society, 1883.
[2] See E. Kehrer's case. Cent. für Gyn., No. 36.

vagina and remains of the perineum to the sides of the pelvis and tuberosities of the ischium, causing the vagina to gap open as an immense

FIG. 102



S M, projecting portion of sphincter muscles; *C S*, cavity of the sheath; *I*, incision; *S*, suture.

cavity, the sides of which cannot be approximated by pulling together with tenacula or even by extensive flap-splitting operations. I describe

below a case of this kind in which the uterus was used to fill an enormous loss of tissue in the rectovaginal septum.[1]

Important Tissue Involved.—In tears of the first degree no important tissues are involved. In central tears of the second degree, the rectovesical and deep pelvic fascia, triangular ligament, central tendon, and decussating fibres of the levator ani muscle are severed. In lateral tears of the second degree, extending by the side of the rectum, the rectovesical and deep pelvic fascia are torn, and the puborectal portion of the levator ani muscle and triangular ligaments are separated from the rectum.

In the third degree the rectovesical and deep pelvic fascia, decussating fibres of the levator ani and sphincter muscles are severed. The triangular ligament is lacerated in the median line, but not separated from the anus. Other muscles are of minor importance, and cannot be given surgical attention even if it was desirable.

In the irregular varieties of tears the important tissue involved depends upon the direction and extent of the laceration, for instance, the bulb of the vestibule may be injured or the vascular region of the clitoris encroached upon in the transverse form. In bilateral tears of the perineum the rectum may be practically enucleated except for its posterior or coccygeal attachment. Deep vaginal tears may involve the bladder, uterus, rectum, and base of the broad ligament.

Submucous tears are common and often escape detection after cicatrization; the skin being intact, it is presumed no injury has occurred. If the perineum be palpated between the thumb and finger a very thin septum will be found, while the anterior portion of the perineum consists of little more than skin and mucous membrane.

I saw a recent tear where the external or visible lesion was a tear in the fourchette barely large enough to admit the finger, but within an immense pocket occupied the place of the distended perineum, the sides of which had retracted until there was fully an inch and a quarter space between them. We are led to believe this is not an uncommon

[1] In the case of Mrs. Garrett (Grady Hospital, Atlanta, Ga.) the rectum was extirpated, the sigmoid flexure drawn down and its posterior margin united to the anal segment, but one and a quarter inches of the vaginal side of the intestine sloughed. Four attempts were made to close the breach in the rectovaginal septum by flap-splitting and flap-making operations, but they failed, all flaps sloughing. Following the last attempt an additional section of the vaginal side of the intestine sloughed, leaving a septum between the rectum and vagina below the cervix not more than one and a quarter inches in depth. Now, as the vagina and rectum were standing open as one immense cavity, completely lined with dense cicatricial tissue, and as there was no possibility of making another flap operation, the cervix was drawn down to the perineum; the fold on either side of it was denuded and closed with silkworm sutures after Emmet's method in perineorrhaphy. The posterior lip of the cervix was then trimmed off and united to the posterior surface of the perineum.

The results were fairly good, but to secure a satisfactory perineum another operation will be required.

Bringing the uterus down and stitching the cervix to the perineum enabled me to construct a new rectovaginal septum, utilizing the posterior wall of the cervix and mucous membrane beneath Douglas' pouch for the anterior wall of the rectum.

The next step will consist in amputating the posterior lip and splitting the cervix, leaving enough of it to maintain the present identity of the new rectovaginal septum. The uterus then will be released and can be disposed of in two ways, that is, by elevating it to its normal position or doing hysterectomy.

The case is a unique one, but it shows the utility of the cervix and uterus in filling in enormous gaps in the rectovaginal septum similar to its use in closing large vesicovaginal fistula.

thing, judging from the number of cases of wide separation of the muscles and fascia that fall into our hands.

Fasciæ.—The fasciæ to be especially noted are: (1) The rectovesical, which lines the concavity of the levator ani muscle, and, therefore, rests upon its superior surface; (2) the deep pelvic fascia, which covers the convex or inferior surface of the muscle and lies immediately adjacent to it; (3) the triangular ligament, which embraces the layers of fascia external to the last mentioned, covering the pelvic outlet anterior to

Fig. 103

Perineorrhaphy. In central lacerations, *V R*, the fascia, *T L*, does not retract beyond a slight extent, but in lateral tears extending around to the posterior verge of the anus the triangular ligament is torn through on one side in the direction of the dotted line *V* to *L A*, and is then free to retract in the direction of its bony attachments.

the anus. Through all of them the vagina and urethra pass. The rectum passes through the first two and is attached to the posterior border of the latter in the median line. The deep pelvic and rectovesical fascia do not retract deeply beneath the surface of lacerated parts. They are held more or less in position by their anteroposterior attachments to the pelvis, and especially to the levator ani muscles, consequently these two layers of fascia can be easily located.

In median lacerations (complete and incomplete) of the triangular ligament, retraction into the tissue does not occur, for its attachment to the rectum is not disturbed; but in lateral lacerations, extending posteriorly to the rear margin of the anus, the triangular ligament is torn through on one side and it is then free to retract in the direction of the dotted line (*L A*), producing the appearance depicted in Fig. 103, though the skin is not torn the full extent of the laceration; the anus is displaced a little to the opposite side (Fig. 104).

FIG. 104

Perineorrhaphy. Representing lateral laceration in which the triangular ligament is severed. The anus is displaced slightly to the opposite side.

Exceptions to this rule occur when the line of separation passes through the central tendon down to the sphincter ani and then skirts around the muscle to the rear of the anus. In this instance the triangular ligament is not completely separated from the central tendon, which holds it fast to the deep fascia, preventing retraction.

If there are reasons to believe that the triangular ligament has been severed, its lower border should be palpated by introducing the index finger into the vagina and placing the thumb on the perineum to one side of the anus; then by rolling the tissue between them in the vertical

direction its presence or absence may be noted. If it cannot be felt, insert a pair of tenaculum forceps in the side of the torn perineum opposite the anus—that is, in the part separated from it just above the external sphincter—and draw it toward the median line, with a view of putting the severed portion of the ligament upon the stretch, then palpate as above described, and its lower border may be felt between the fingers. It may be isolated or exposed by blunt dissection. While holding the parts taut with the hooked forceps, expose the bulbocavernosus by dissecting away midway between the deep pelvic fascia and the cutaneous surface, where the principal layer of this ligament will be found in contact with the external side of the muscle. Or if accurate knowledge of the relative position of several layers of fascia is wanting, a blunt hook may be passed behind the lower border of the triangular ligament into the space between the latter and the deep fascia, at a point just external to the central perineal tendon, by inserting it into the fatty tissue beneath the skin with its point directed outward until buried about half an inch, next turn directly inward in the direction of the axis of the pelvic outlet until it reaches the deep fascia, where it will meet with a feeling of resistance; then by rotating the instrument upon the axis of its handle the point is directed toward the median line. This will produce a little prominence on the side of the torn perineum posterior to the triangular ligament where it has been separated from the conjoined tendon of the perineum. From this point the lacerated edges of the ligament can be isolated and approximated with sutures.

MUSCLES.—The muscles most concerned in the operation are the levator ani. Many papers dealing with its function and repair in recent literature show that the importance of the muscle is being impressed upon the surgeon. The late Dr. Skene claimed credit for first calling attention to injuries of this muscle years ago. Yet there are many who have failed to understand the principle upon which it acts as a support to the floor of the pelvis. It is more or less parabolic in shape (Fig. 105), and hangs anteroposteriorly in the pelvis like a loosely swinging hammock. If a person should lie in such a swing the tendency would be for him to slip through the opening like a wedge, forcing the sides apart; the pelvic viscera bear the same relation to this muscle. It is more or less parabolic in shape and receives the intra-abdominal force in the reverse direction in which a parabolic reflector casts off rays of light. Intra-abdominal pressure strikes all parts of the muscle within its concavity and is deflected to the centre, showing a tendency to concentrate at a point corresponding to the perineum (Fig. 106). The latter forms a bond across the cleft, holding the two sides of the muscle together, converting the opening into two small ones, rectal and vaginal. When this bond (perineum) is severed the sides of the levator ani muscle separate and resistance to superimposed weight diminishes. The pelvic contents acting upon the principle of a wedge have a tendency to drop downward and force the sides of the levator ani muscle apart, and destroy to a great degree the support the pelvic floor should normally afford.

The importance of the decussating fibres of the muscles passing across the perineum from side to side are underestimated. They not only assist in holding the two sides of the muscle together, but aid in closing the vaginal introitus and supporting the base of the bladder. When ruptured, these fibres retract to such an extent that their ends cannot be brought together, therefore union of this muscle as commonly effected is nothing more than edge to edge contact in the direction of its fibres, which in ordinary circumstances must eventually separate. The transversus perinei muscles, the bulbocavernosus, etc., do not retract to a very great extent, and can be found in close relation to the protecting fascia. The latter muscles are small and contribute very

FIG. 105

A dissection of the levator and muscle: 1, rectum; 2, coccyx; 3, labium minus; 4, sphincter ani externus; 5, fibres of the levator ani arising from the os pubis; 6, fibres arising from the triangular ligament; 7, fibres arising from the "white line"; 8, fibres arising from the spine of the ischium. (Browning.)

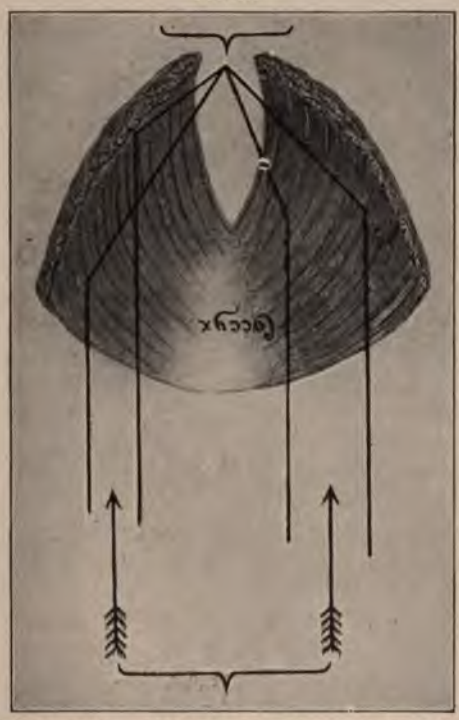
little to the support of the floor of the pelvis, and as their isolation and suturing are unimportant, I have eliminated their consideration as an unnecessary complication.

Results.—The immediate consequences of an incomplete laceration are hemorrhage and liability to infection; when the laceration is complete there must be added to these incontinence of feces and flatus.

The remote consequences would be largely absent were the laceration to occur at anytime other than the time at which it well-nigh always does occur—viz., at delivery—because, happening at this time it not infrequently so interferes with involution of the genital tract as to bring on a most unpleasant train of symptoms.

While it is not contended that the "perineal body" simply as such affords support to any of the pelvic viscera the muscles and fascia of which it is composed as long as they retain their integrity and tonicity are of much value in preserving the normal relations at least of the bladder, vagina, and rectum. They prevent a pouching forward of the rectum and a sagging of the base of the bladder. But when they have been deprived of one of their fixed points of action by destruction of the central perineal nidus they are inoperative to a degree depending upon the extent of the laceration. Their divided ends retract and

FIG. 106



Perineorrhaphy. The levator ani muscle being more or less parabolic in shape, receives the intra-abdominal force in the reverse direction to that in which a parabolic reflector casts off rays of light. The intra-abdominal pressure strikes all parts of the muscle within its concavity and is deflected to the centre, showing a tendency to concentrate at a point corresponding to the perineum.

so weaken the region which they formerly covered. The result will be, as it were, a hernia of the rectum or bladder, or both, with the ordinary discomforts of rectocele and cystocele. These tumors will grow larger and larger under the straining of defecation and micturition. The bladder cannot be entirely emptied and cystitis may result. The rectum likewise is emptied with difficulty. When labor occurs the genital tract enters at once upon a retrograde metamorphosis looking to the ultimate return of the uterine and vaginal walls to their usual thick-

ness. This degeneration is largely due to the decreased blood supply to the pelvis immediately subsequent to labor. Anything, therefore, which interferes with the cut off of the pelvic blood supply after labor interferes with involution and causes a state of subinvolution—and a most common interfering factor is a lacerated perineum. The lack of vaginal involution, as well as the removal of the normal mechanical support of the bladder and rectum, is not an inconsequential factor in the production of cystocele and rectocele. There are, therefore, three sets of local symptoms: (1) pain produced by the dragging of a heavy uterus on its ligaments; (2) the ordinary symptoms of cystocele and rectocele; (3) leucorrhœa together with any disturbance of menstruation which may come from pelvic congestion.

Besides these local symptoms there is another set—reflex nervous symptoms—which may appear promptly or be delayed for years. They may be slight or so predominant as to withdraw attention from the local lesion. These may take the form of any nervous affection whatever. Parietal headache, digestive disturbance, neuralgia in any part of the body, hysteria, chorea, and epilepsy are more or less common consequences. There may be a general neurasthenic condition, with loss of strength and flesh, malaise, anæmia, etc.

These reflex nervous symptoms are produced in two ways: (1) venous stasis compresses the nerve terminals and may so account for all of them; (2) the cicatrix may contract with the same compressing effect.

Operations for Laceration of the Perineum.—There are a number of operations for incomplete lacerations that have but little more than the simple principles involved in the old operation of Sims, the difference being entirely in the manner of suturing. Among these are Garrigues', Outerbridge's, Cleveland's, Dudley's, Goldspohn's, Reed's and others. Then there are those who follow Emmet so closely that the illustration of the one classical operation will suffice for the entire class. Among these are Bischoff, Andrews, Goffe, Kelly and others.

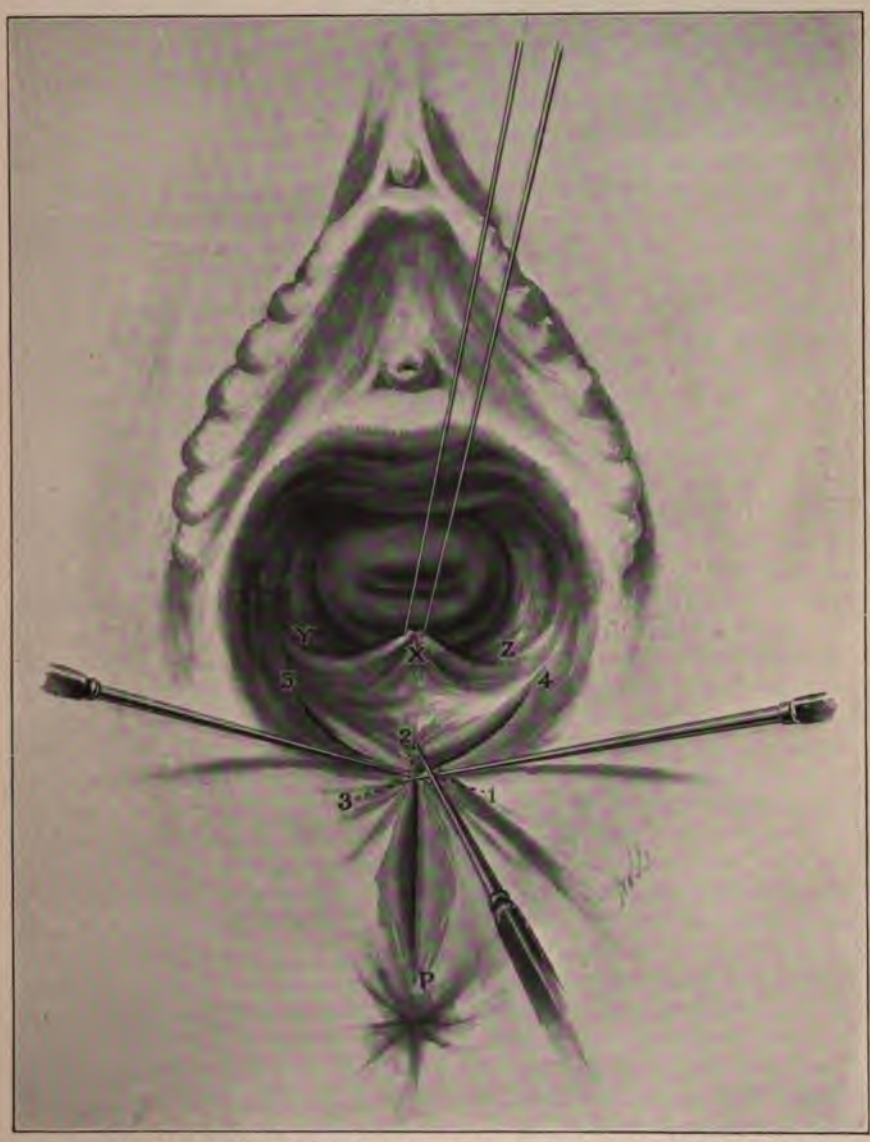
Denudation of the Perineum.—I will not give minute directions for denuding the perineal surface because the conditions vary so much in different cases it is next to impossible to express in writing a clear idea of the requirements that are to be met. The chief points to be observed are not to pare off the skin of the vulva, not to extend the denudation forward beyond the posterior commissure, but to remove scar tissue and mucous membrane far enough within the vagina to gain easy access to the edge of the levator ani muscle. Irregular lacerations involving the vagina and distortions caused by scar tissue must govern modifications of the above when present, and in closing them each case must be a law unto itself. Denudation in tears extending into the sulci by the side of the rectum requires careful attention. (See Emmet's operation.)

Operations for Incomplete Laceration of the Perineum. Emmet's Operation. *Technique:*[1] *First Step.*—A tenaculum is hooked in the

[1] Condensed from Emmet's paper, Southern Surgical Association, Richmond, Va.

rectocele, drawing it downward and forward toward the neck of the bladder, testing in this way different points along the median line from

FIG. 107



Perineorrhaphy. The parts are drawn together with tenacula to show the places to be denuded. (Emmet.)

below backward, until a certain amount of resistance is felt, which will form the mucous membrane on the posterior vaginal wall into a trian-

gular fold running from its apex at *X*, where the tenaculum is inserted, in the direction of *Y* and *P*, points on the sides of the vagina that are more or less fixed. At *X*, which is usually about the prominence of the rectocele, a retention string is passed through the mucous membrane and turned over the mons veneris to be held by an assistant (Fig. 107).

Second Step.—A tenaculum is then inserted on each side of the ostium vaginæ at points corresponding to the posterior commissure, which are marked by the lowest of the caruncule myrtiformes (1–3). The instruments are crossed over to opposite sides and the parts drawn together in the median line. A third tenaculum is then fastened into the central line of the rectocele at a point that can be drawn down to 1–3 without undue tension. The posterior vaginal wall will then be thrown in two folds, forming deep sulci, extending from the perineum upward on either side of the rectum. The right sulcus marked by the lines 3–5 and 2–5, the left sulcus by the lines 1–4 and 2–4 (Fig. 107).

Third Step.—The parts within the vagina to be denuded lie within these lines. A tenaculum is inserted in the apex (5) of the sulcus on the operator's left, then tension on tenacula (1 and 3) is relaxed and the ostium vaginæ widely dilated. Tenacula 3 and 5 are drawn in opposite directions, throwing the mucous membrane between them into a ridge, which is pared off with the scissors. Next tenacula 2 and 5 are drawn in opposite directions, forming a similar ridge which is removed by the scissors. The tenaculum 5 is then disengaged and those at 1, 2, and 3 are again drawn together at a common point (the posterior commissure), to reproduce the sulcus on the patient's left. A tenaculum is then inserted at the tip of the sulcus 4 and the ostium vaginæ again relaxed and dilated. The ridges of the mucous membrane, formed by drawing tenacula at 1–4 and 2–4 apart are trimmed away in a similar manner to those on the patient's right. Tenaculum 4 is then removed and the skin margins of perineum 3 *P* and 1 *P* are trimmed away.

As the vaginal orifice is held open, the whole field to be denuded is then completely outlined. The island of mucous membrane surrounded by the outlines just made is trimmed away in strips. In addition to the raw surface of the perineum, two triangles are formed, one in the sulcus on either side of the rectum, with apices extending upward and bases downward.

Fourth Step.—Silver wire is used as suture material. The first stitch is introduced near the apex of the right sulcus just below point 5; the needle entering a little upon the inner side of the line 2–5, passes beneath the raw surface in the sulcus, and emerges to the outer side of the line 3–5. Succeeding sutures are introduced in the same way about one-fourth inch apart, until they reach a point opposite the retention string fastened to the rectocele at *X*. The upper extremity of the left sulcus (beginning at 4) is then sutured to a corresponding point on that side. Returning to the right side the stitches for the remaining part of that sulcus are inserted down to a point near 2–3. Again

changing to the left side the remaining part of that sulcus is treated in the same way down to a corresponding point, 1–2.

Fifth Step.—A wire suture (known as the crown suture) is then inserted just within the vaginal orifice on the operator's right side at a point beneath the lowest caruncula myrtiformis (3), penetrating the tissues deeply in the direction of the ascending ramus of the pubic bone, securing the edges of the levator ani muscle, then emerges from the raw surface just beneath the mucous membrane at a point half an inch internal to the place where the needle entered, then crosses over to the raw surface on the inner side of the lower extremity of the left sulcus and is passed beneath the tip of the mucous membrane forming the triangle (4–2–5) over the rectocele at the point marked 2. It emerges from the raw surface on the inner side of the right sulcus, crosses over and enters the raw surface on the outer side of the same sulcus half an inch behind the lowest caruncula, penetrating the perineum deeply, but in the reverse order to the other side and emerges from the mucous membrane of the ostium vaginæ on the operator's left side at the point marked 3, which corresponds to the place of entry 1.

The ends of the sutures on each side are caught together with separate pairs of compression forceps and turned aside to prevent tangling or accidental withdrawal. Below these three or four additional sutures are inserted, closing the external or perineal margin of the wound to the angle marked P. The first suture is then twisted, cut short, and turned flat upon the surface, after which the others are secured in a similar manner in the order in which they are introduced. All of them are left in place until the parts are firmly united.

NOBLE'S OPERATION. *Technique.*—The perineal denudation should extend from the skin to the upper or inner border of the levator ani muscle and from the rectal angle to the point marking the posterior commissure. The latter can be recognized by existing scars and carunculæ myrtiformes. This makes an irregular quadrilateral surface on each side. The anterior is shorter than the rectal border, as the cutaneous and vaginal lines converge slightly at their anterior extremities.

When the tears extend up in the vagina the outlines of denudation follow Emmet's description, especially in the sulci by the sides of the rectum. But in cases of rectocele and relaxation of the posterior vaginal wall the projecting tongue of mucous membrane usually left at this point is trimmed away, and the denudation is carried higher up the vagina, making a triangular denudation with its base directed toward the perineum.

Removal of mucous membrane only at this point is deemed insufficient, the incision, therefore, is extended into the rectovaginal interspace for the purpose of excising a portion of the relaxed vagina. Suturing the edges of the vaginal walls directly together in front of the rectocele gives better support to the protruding rectum, and, further, does a great deal we otherwise expect to accomplish through the process.

The next step is exposure of the levator ani muscle. This is done

by inserting the thumb and finger in the vagina and grasping the muscle as it courses along the vaginal border of the denuded surface. It is then seized with a pair of tenaculum forceps (Fig. 108), drawn into the

FIG. 108

Tenaculum forceps used to draw out the levator ani muscle.

vaginal orifice and the sheath of the muscle is opened by blunt dissection in the direction of the fibres of the muscle (Fig. 109). After the sheath has been opened on the upper side of the forceps to the

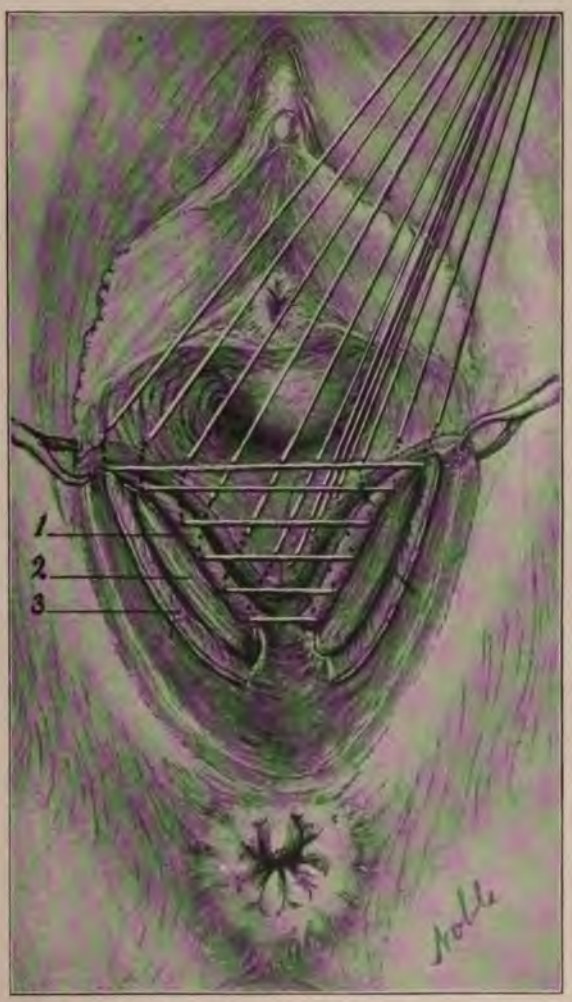
FIG. 109

The levator ani muscle is then seized with a pair of tenaculum forceps, turned into the vaginal orifice and the sheath opened by blunt dissection in the direction of the fibres of the muscle.

crown of the perineum, the handle of the forceps is turned upward and the dissection extended down to the rectum, deep penetration and laceration of the muscle being carefully avoided. The second pair of

tenaculum forceps is then inserted within the sheath of the muscle, taking firm hold of the muscular tissue, and separation of the fascia is completed by the finger, exposing a strip of muscle about three-fourths of an inch wide. The opposite muscle is exposed in the same way.

FIG. 110



The vaginal margin is closed by inserting medium-sized catgut sutures about three-eighths of an inch from the edge of the wound, penetrating first the vaginal mucous membrane and next the rectovesical fascia, issuing from the space formed by separating the latter and the levator ani muscle. They cross to the opposite side, pass between the levator ani muscle and the rectovesical fascia (3-1), puncturing the latter about three-eighths of an inch from the edge, and emerge upon the vaginal surface.

The vaginal margin is closed (Fig. 110) by inserting medium-sized catgut sutures about three-eighths of an inch from the edge, but when

this suture reaches the levator ani muscle the fascia is included in the stitches. The needle penetrates the vaginal mucous membrane and next the rectovesical fascia (posterior layer) issuing from the space formed by separating the latter from the levator ani muscle. It crosses to the opposite side, passes between the levator muscle and the rectovesical fascia, puncturing the latter about three-eighths of an inch from the edge, and emerges upon the vaginal surface. The sutures, if interrupted, are tied as they are inserted, and repeated until the fascia is closed as far as the crown of the perineum (Fig. 111). When

FIG. 111

Showing rectovesical fascia closed by vaginal sutures. The sutures, if interrupted, are tied as they are inserted, and repeated until the fascia (1) is closed as far as the crown of the perineum.

using the continuous sutures I frequently tie it at the posterior commissure and leave the end long, turning it aside temporarily to be used later for closing the margins of the skin.

The edge of the levator ani muscle on the right side is drawn into the open wound by means of tenaculum forceps, and a kangaroo tendon passed through (Fig. 112) it at a point about three-fourths of an inch

back from its border and low down by the side of the rectum; the kangaroo is carried across the median line to the border of the muscle on the opposite side and passed through it in the reverse direction. On tying the edges of the muscle approximate snugly immediately in front of the rectum. In like manner the second kangaroo is passed through both sides of the muscle just below the crown of the perineum, the ends caught in a pair of forceps and turned aside. Between these two sutures an incision one-half inch in length is made in the

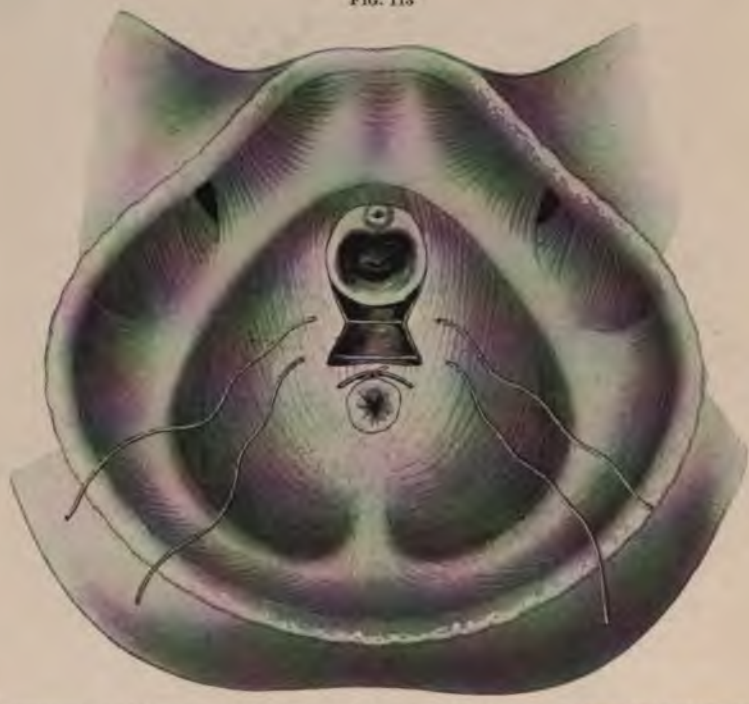
FIG. 112

A kangaroo tendon is passed through the edges of the levator muscle low down by the side of the rectum; *x x*, incision in puborectal section of levator ani muscle

puborectal part of the muscle, inclining downward and outward at an angle of about 45 degrees to the horizon (Fig. 113). This cuts the muscle nearly perpendicular to the course of its fibres. The opposite border of the muscle is treated in the same way. The severed ends are turned across the perineum in front of the anus with the tenaculum forceps (held by an assistant) and united in the median line by tying the kangaroo sutures (last inserted) tight enough to keep the ends of the muscles together without pressure. Below this point a triangular

pocket is formed which is effaced by passing a kangaroo suture from side to side, the needle being passed just beyond the extremities of the incision in the muscle. When this suture is drawn tight it forces the two sides of the muscle together completely (Fig. 114). Three or four kangaroo sutures are passed around the bulbocavernosus and the conjoined tendon formed by the triangular ligament and deep fascia. They should be inserted about midway between the cutaneous surface and deep fascia, penetrating the perineum deeply and emerge between the deep fascia and the levator ani muscle about half an inch from the edge of the former. They are returned upon the opposite side of the

FIG. 113



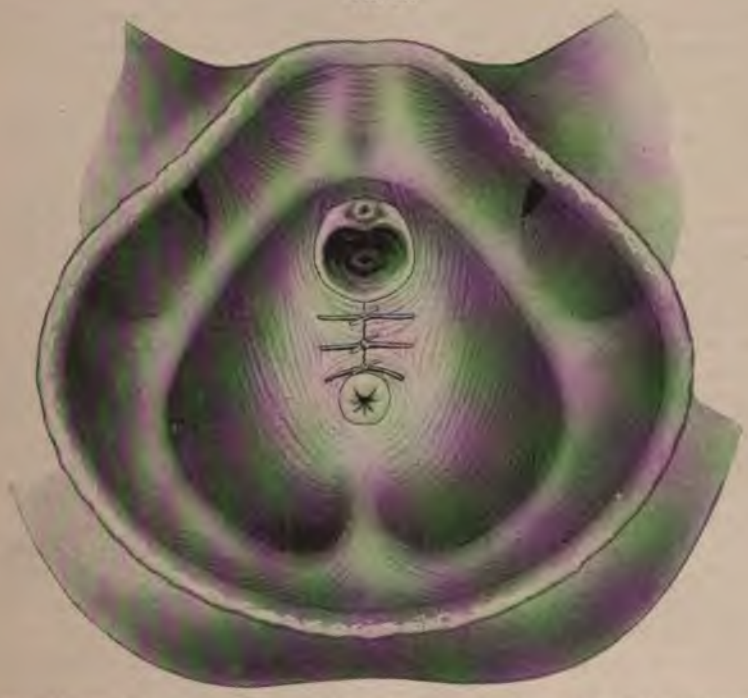
Between these two sutures an incision, one-half inch in length, is made in the puborectal portion of the muscle on either side.

perineum in reverse order, and emerge external to the bulbocavernosus at a place corresponding to the starting point. The lower stitch should be placed close to the rectum and the highest about three-eighths of an inch below the posterior commissure and the remaining space divided by the other two. The second stitch in front of the rectum should pass through a small portion of the levator ani muscle to prevent formation of air space. When the sutures are tied the part embraced in their grasp comes in close contact and the edges of the deep fascia and triangular ligament are brought into accurate apposition.

The last step in the operation consists in closing the skin and superficial fascia with interrupted sutures or by continuing down to the angle near the anus, the whipstitch of catgut left hanging at the crown of the perineum.

I am sure a decided advancement has been made in the operation by changing the method of suturing the edges of the levator ani muscle to the plan of incising and stitching together in the median line the cut ends of the puborectal portion. It forms a strong loop of muscle around the vaginal orifice, giving the perineum better support and makes a connecting link between the two sides of the muscle, prevent-

FIG. 114



The cut ends of the muscles are turned across the perineum and united in the median line, reproducing the decussating fibres.

ing its tendency to separate. It draws the perineum forward, closing the vaginal orifice effectively and prevents the inclination of the bladder and urethra to turn outward.

The operation is simple and devoid of much hemorrhage. It does not increase the pain unless the sutures are tied too tightly through carelessness.

In the time that I have been doing this operation many cases have been closely watched, and I am glad to say that it has stood the test of childbirth effectively, and I feel justified in making the statement

that the results, both immediate and remote, are far superior to other methods I have tried.

FLAP-SPLITTING OPERATIONS.—A clear account of early flap-splitting is given in Scanzoni's *Diseases of Females*, page 580, American edition, 1861. It describes Langenbeck's operation, in which the recto-vaginal septum is split and sutured so as to draw the separated flaps up against the posterior surface of the perineum.

This was followed by John Duncan's, Simpson's, and Futch-Walberg's operations, whose methods have been perfected by Tait. The latter's operation, representing the highest attainment of the flap-splitting methods, is selected for illustration.

TAIT'S OPERATION.—Though Tait was not the first to do the flap-splitting operation, he perfected and popularized it, and, therefore, is entitled to the credit for the ingenuity and originality so ably displayed.

He has devised two operations, one each for incomplete and complete lacerations. The first is called the V and the second the H operation, from the resemblance of the lines of incision to these letters.

In the V operation he does not make a regular vaginal flap and "seldom does more than make the primary incision." "If we dissect the flap up too much, we are only weakening the parts and defeating the primary idea of the operation, which is not a denuding one, but a flap-splitting one; too extensive incision completely bisects the perineal mass, which is not advisable." (McKay.)

In the H operation he does make a "real flap of mucous membrane." There seems to be some discrepancy in the details of various authors describing these operations, and as Tait has complained of "most inextricable" confusion arising from this source, the following account is condensed from McKay's description, to which the originator gave his unqualified endorsement.

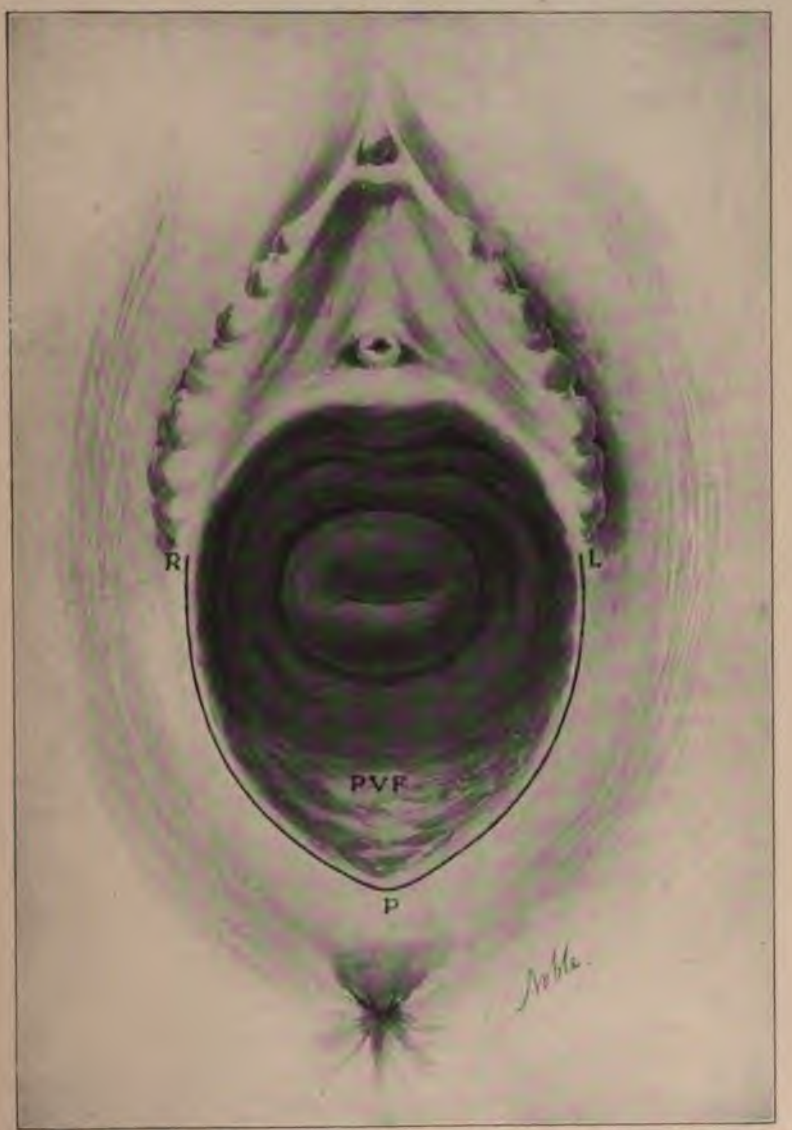
First Step.—With two fingers in the rectum as a guide, a short vertical nick is made in the margin of skin and mucous membrane in the median line just in front of the anus at *P*, Fig. 115. At this point the sharp point of the scissors is forced three-fourths of an inch into the tissue and an incision made along the junction of skin and mucous membrane to the right side of the vaginal orifice to a point marked *R*, just posterior to the inferior extremity of the labium minus. The opposite side is incised in the same way to the point marked *L*.

Second Step.—The raw V-shaped surface made by the incision is slightly increased by carefully snipping along the edges of the imperfect vaginal flap *PVF*, which retracts more and more as it is cut, widening the denudation. Mr. Tait says most emphatically "this surface (*R L P*) should not be a large one, and he seldom does more than make the primary incision." (McKay.)

Third Step.—A needle on a handle is used, the point entering just inside the skin margin at 1 (Fig. 116); emerges in the raw surface near the median line at 2, re-enters a corresponding point at 3, and emerges just inside the skin edge at 4. The needle is then threaded with silk-

worm-gut, and withdrawal pulls the suture into place. The second suture is introduced in the same way, entering the needle at 5, out at 6,

FIG. 115

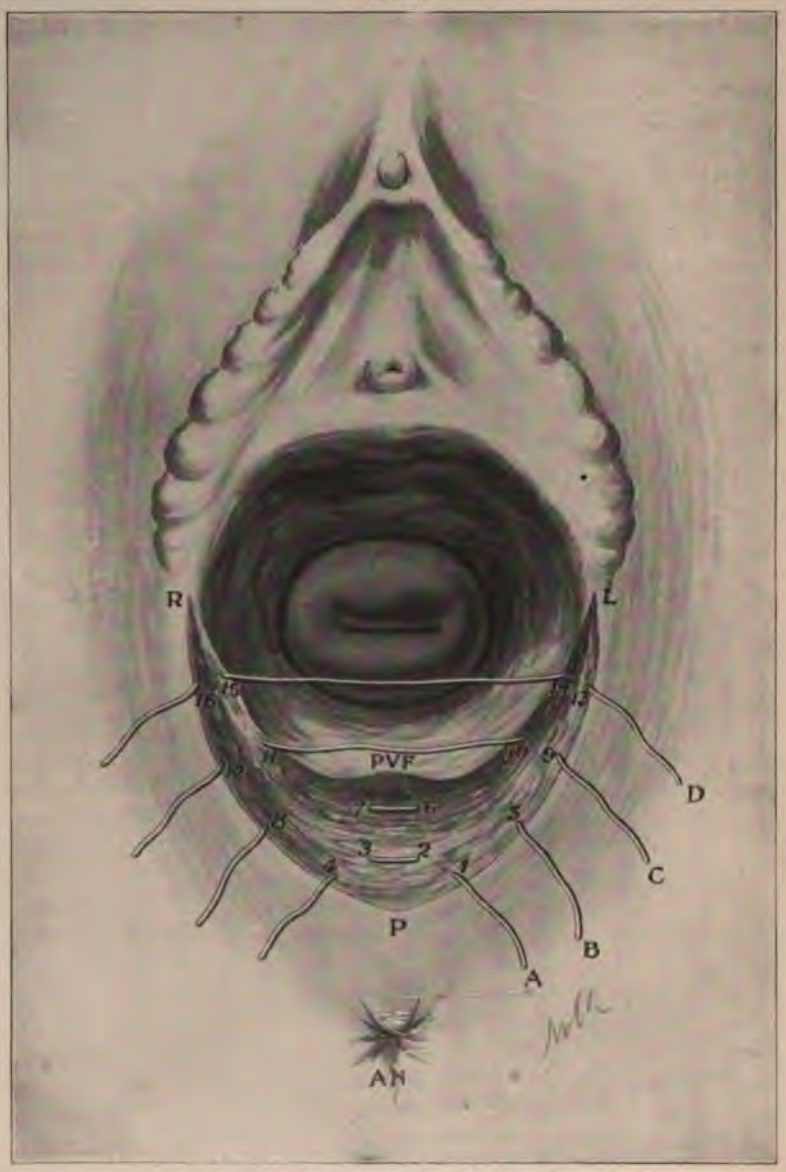


Tait's operation for incomplete tear of the perineum: *L P R*, line of incision; *P V F*, posterior vaginal flap; *P*, perineum.

in again at 7, and out at 8; thus the two lower sutures are introduced with one sweep of the needle; the two upper ones require two passes

of the needle. The needle is inserted at 9, emerges at 10, is threaded and withdrawn. It penetrates again at 12, emerges at 11, is threaded

FIG. 116



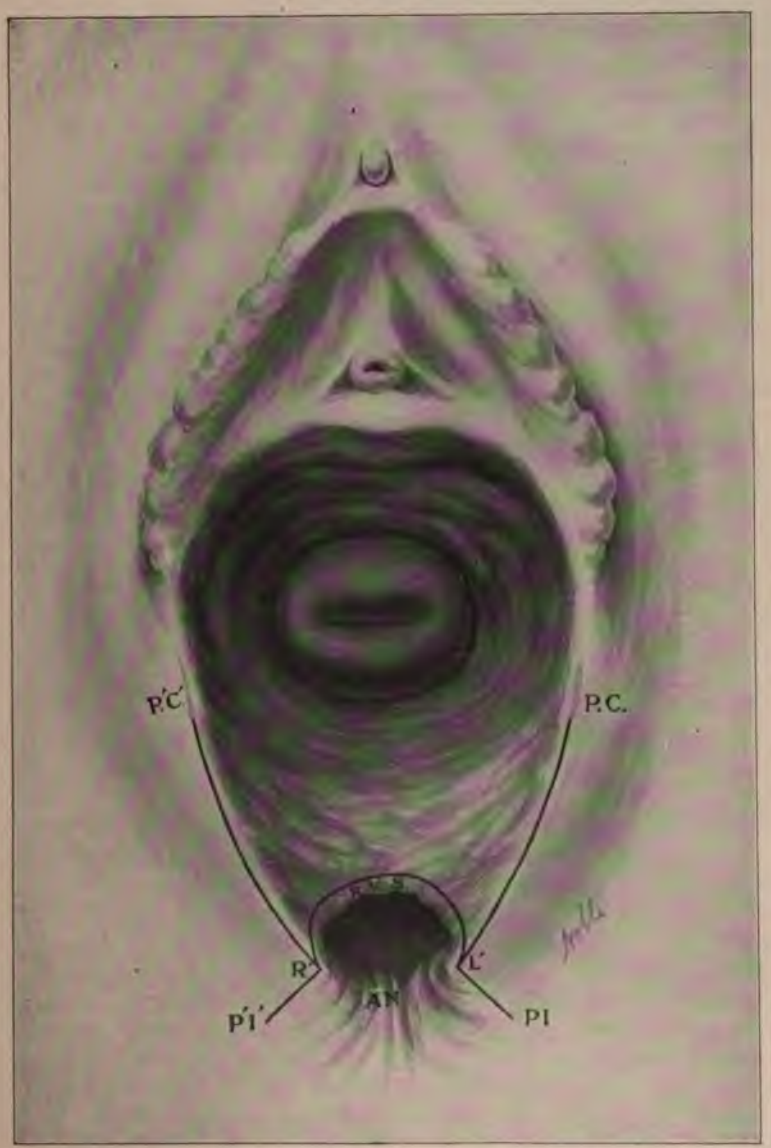
Same as Fig. 115, with sutures introduced.

with the other end of the suture, which is drawn across in front of the posterior vaginal flap and out at point of entry. The last and topmost

suture is passed in the same way at points marked by the figures 13, 14, 15, and 16.

Each end of the sutures is secured with catch forceps to prevent accidental withdrawal.

FIG. 117



Tait's operation for complete tear of perineum: *P C I'* and *P' C' R'*, lateral incisions; *I' R'*, incision of rectovaginal septum; *I' P I*, left posterior incision; *R' P' I'*, right posterior incision; *A N*, anus; *R V S*, rectovaginal septum.

Fourth Step.—The forceps holding the ends of the upper sutures *B C D* are turned up over the mons and held by an assistant, the wound is irrigated, sponged and spurting vessels secured. An assistant then presses the buttocks together as the lower suture *A* is gently drawn upon and tied. The second suture *D* is tied in the same way. The assistant presses the sides *R L* strongly together while the operator ties sutures *B* and *C*.

Should too much cutting be done in the process of dissection and a "real flap" be formed it is left to take care of itself.

Operations for Complete Lacerations of the Perineum. OPERATION. *First Step.*—The scissors enter at *L'* (Fig. 117) (sphincter dimple of Emmet) to a depth of half an inch, then follows the edge of the rectovaginal septum to the opposite sphincter dimple *R'*. From these two points incisions are made in an upward direction along the mucocutaneous margin to the original site of the posterior commissure (*PC* and *P'C'*). Then an incision is made on each side, beginning at the sphincter dimple, cutting downward and outward to *PI* and *P'I'*. These should be made deep enough to expose the ends of the sphincter muscles.

Second Step.—The posterior vaginal flap *R, VF, L* (Fig. 118) forms a W-shaped surface which is increased by further dissection of the flap, snipping underneath as it is held up until a "fairly large surface, shaped like the letter H," is formed.

Third Step.—Two hooks are inserted into each flap, the rectal and vaginal; the former is held up out of the way while the latter is drawn downward in the direction of the anus, making, as it were, a rectal flap.

The sutures are placed in two passes of the needle. It enters the raw surface at a point marked 1 in the angle at the extremity of the posterior incision *PI* (on patient's left), just inside the edge of skin, emerges in the raw surface near the median line at 2, crosses just over this line to 3, when it again enters the raw surface, emerging at 4. The needle is then threaded, and on being withdrawn pulls the suture into place and its ends secured with a catch forceps. The other sutures are introduced in the same way: for instance, for suture *B* the needle enters at 5, out at 6, in at 7 to emerge at 8.

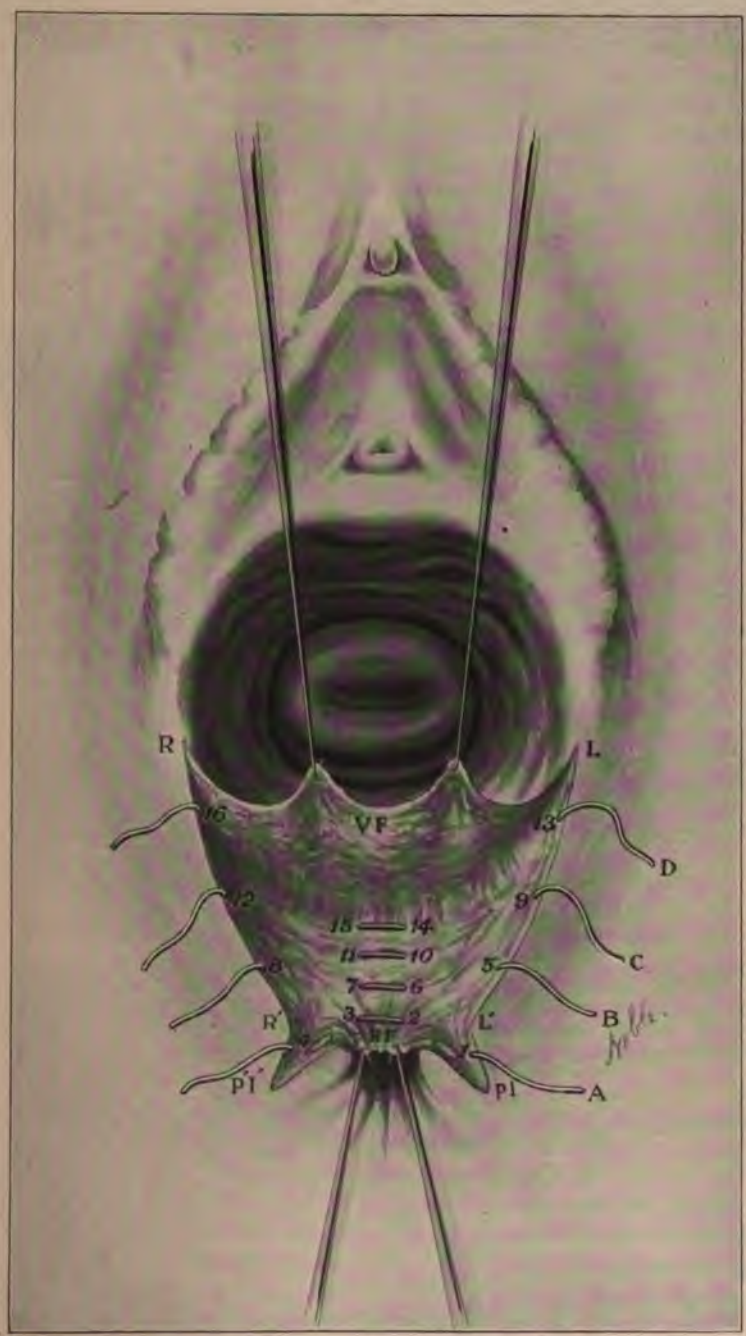
Fourth Step.—The forceps holding the three upper sutures (*B C D*) are turned over the mons and held by an assistant. The field of operation is then irrigated, sponged, and spurting vessels secured. An assistant presses the buttocks together as the lower suture *A* is gently drawn upon and tied, while another assistant draws downward the rectal flap. Each suture is tied in the same way from below upward.

The vaginal flap is left to find its own place against the vaginal surface of the newly made perineum, to which it becomes adherent.

"I do not apply any dressings but direct the nurse to keep the parts dry." (Tait.) The bowels should be washed out daily and feces not allowed to accumulate and become hardened. The external genitals should be sponged with Condy's fluid twice a day. (McKay.)

The sutures are left in for two or three weeks, and are then removed while the patient is in the lithotomy position.

FIG. 118



Insertion of sutures in Tait's operation for complete laceration of the perineum.

There is no real advantage in not including the edge of the skin in the sutures; pain for the first few days is less, but the scar resulting, the so-called new median raphé of Tait, is of no advantage to the patient; upon the other hand, an ideal perineum should have no cicatricial or inelastic tissue in it. Besides, this liability to infection of stitch wounds is greater on account of the granulating surface between the edges of the skin. In this country the sutures are passed through the skin by most operators, because it leaves a cleaner wound and the stitches can be removed much earlier.

FIG. 119

The line of incision (black line) starts on the external side of the sphincter dimple at a point close to one end of the sphincter muscle, *S M*. It follows the edge of the sheath of the muscle passing between it and the rectal mucosa, then turns upward and forward to the cellular interspace of the rectovaginal septum *S*, splitting it in the centre, and returns on the opposite side to a place corresponding to the starting point.

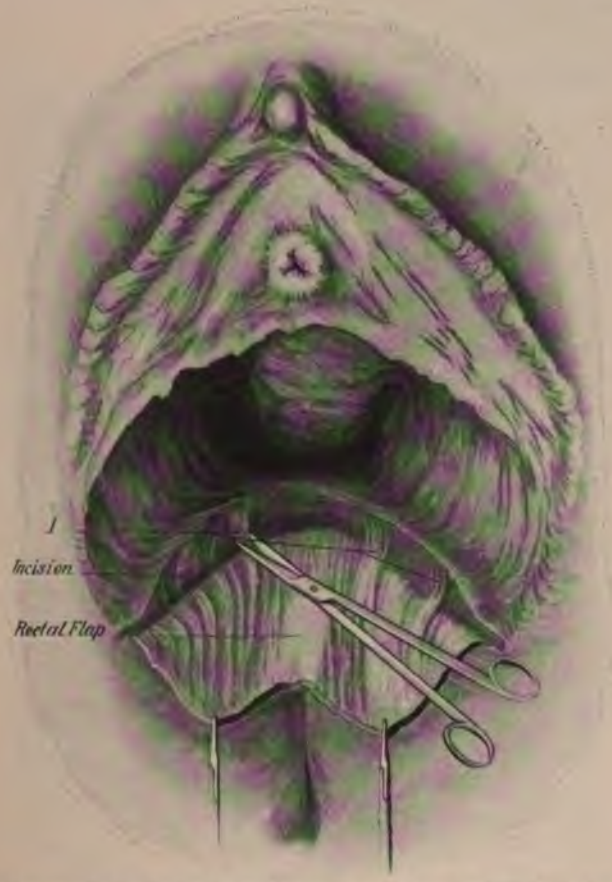
Following Tait, numerous attempts at flap making were made, some of which were confused with those of the distinguished author, notably the method of making the posterior vaginal flap by splitting where the vaginal mucosa joins the skin, cutting on a line extending from the lowest of the caruncule myrtiformes on one side, down around the posterior margin of the vaginal orifice to the lower caruncle on the opposite side, then raising the vaginal mucous membrane by blunt dissection to form the flaps. The two sides of the perineum are approximated by sutures according to the notion of the different operators,

some buried, others going through the skin, or perhaps both, with or without exposing and suturing the edges of the levator ani muscle.

The operation lost its popularity but has recently been revived by Goldspohn.[1]

NOBLE'S OPERATION.—The new operation for complete laceration of the perineum consists in splitting the rectovaginal septum, dissecting

FIG. 120



When slight traction is made upon the rectal flap, ridges or bands of tissue will form across the line of incision; these are cut away as they appear (*I*).

the lower end of the rectum from the vagina and drawing the anterior rectal wall down through and external to the anus, converting a complete tear of the perineum into an incomplete laceration.

Technique.—The line of incision (black line) starts on the external side of the sphincter dimple at a point between the skin and one end

[1] American Journal of Obstetrics, June, 1901, p. 771.

of the sphincter muscle (*SM*, Fig. 119), care being taken not to cut the skin at this point. It follows the edge of the sheath of the muscle, passing between it and the rectal mucosa, making the flap at this point as thick as possible. It then turns upward and forward to the cellular interspace of the rectovaginal septum, splitting it in the centre, and returns on the opposite side to a place corresponding to the starting

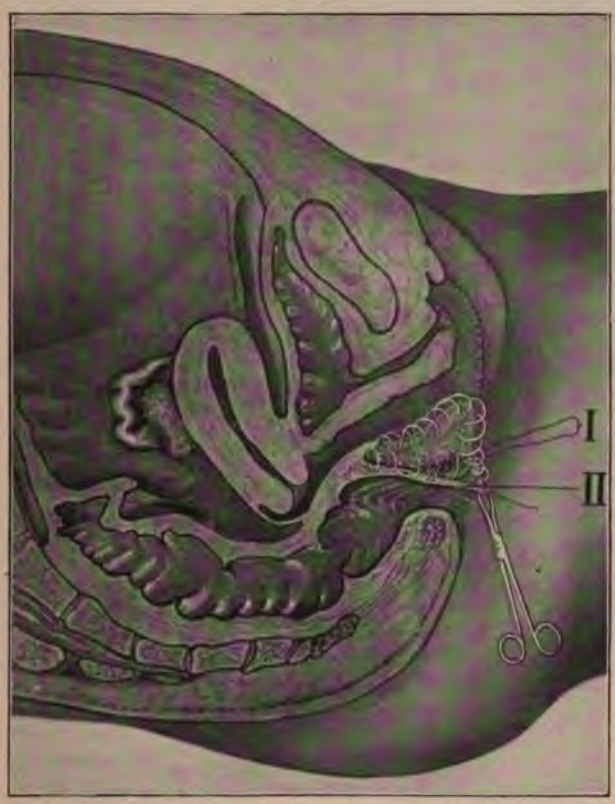
FIG. 121

Two kangaroo or silkworm sutures (tension sutures) are inserted deeply into the perineum behind one end of the sphincter muscle, pass to the opposite side, taking up in crossing the thickest part of the rectal flap, about its middle portion, without penetration of the rectal mucosa, and return to the other end of the sphincter ani, to issue at a point corresponding to the place of introduction.

point. This makes an incision similar to the ordinary flap-splitting operation, except at its extremities. The incision is best made with a pair of sharp-pointed scissors. After cutting through the cicatricial structure to the healthy tissue beneath, two pairs of light compression

forceps are placed on the rectal flap, some distance to either side of the centre, embracing in their grasp the entire thickness of the rectal wall. The left hand should be protected with a rubber glove and the index finger passed into the rectum beyond the angle of the laceration as a guide to prevent perforation of the rectal flap. The forceps are held with the remaining fingers of the left hand, and as slight traction is made upon them, ridges or bands of tissue form across the line of incision. These are cut as they appear (Fig. 120). The point of the scissors should be

FIG. 122



Vertical section of Fig. 121, showing tension sutures *I*, rectal flap *II*, and whipstitch sutures closing mucous membrane and skin. This illustration represents closure with buried sutures.

turned slightly in the direction of the vagina—that is, away from the rectum—to avoid liability of perforating the latter. Unless care is observed the tendency will be to cut the flap too thin,[1] so as not to embrace the entire thickness of the rectum; this can be avoided by confining the incision to the cellular interspace.

[1] This is most likely to occur when separating the mucous membrane from the verge of the anus and sphincter muscles, for the rectal flap is necessarily thinner at this point.

After reaching this stage of the operation there is no longer any necessity for the finger in the rectum. It should be withdrawn, the glove removed and the hands resterilized. The torn surface of the perineum is next denuded and the excess of the vaginal flap cut away. Two silkworm sutures are inserted deeply into the perineum behind one end of the sphincter muscle, passed to the opposite side, taking up

FIG. 123

Whipstitch closing skin is used to fold together the edges of the rectal flap.

in crossing the thickest part of the rectal flap (about its middle portion) without penetrating the rectal mucosa, and return to the other end of the sphincter ani to issue at a point corresponding to the place of introduction (Emmet sutures, Fig. 121). In exceptional cases the sphincter muscle may be very much shortened or retracted, and its ends require

approximation by buried sutures to secure the best immediate results. When the Emmet sutures are tied the wound is converted into the condition of an incomplete laceration (Fig. 122), and is then completed by the method above described for tears of that kind—viz., suturing the rectovesical fascia, incising the levator ani muscle and uniting it end to end, etc., approximating the deep pelvic fascia with kangaroo and closure of skin with catgut.

FIG. 124

The protruding rectal flap is anchored on to the perineal incision to keep it as far from the anus as possible.

The edges of the mucous flap projecting from the rectum are trimmed free of scar tissue, folded together and closed with the continuous catgut sutures (Fig. 123). It is turned forward and anchored over the perineal incision with mattress sutures of silkworm to carry it as far away from the anus as possible, with a view of lessening the risk of infection by

contact with fecal matter (Fig. 124). The kangaroo sutures absorb readily, the rectal flap retracts within the anus and returns to its normal position in seven or eight days.

The advantages are:

1. The removal of liability of infection from the rectum and percolation of fecal matter in the wound.

2. The avoidance of rectal stitches with the pain, distress, ulceration, and cicatrization incident to such sutures.

3. It has an advantage over Warren's (known as Ristine's) operation in this fact, that it is applicable to deep lacerations of the rectovaginal septum, does not distort or disfigure the vagina or turn a lot of cicatricial tissue into the rectum, and is devoid of tediousness of dissecting flaps.

4. It gives uniform success and permits early evacuation of the bowels without jeopardizing results.

5. It is so easy to perform.

EMMET'S OPERATION.—The ends of the retracted sphincter ani muscle are sought and found on either side of the anus near its upper and outer margins, just a little above a transverse line passing horizontally through its centre. Each end of the muscle is marked by a slight depression due to retraction of the muscle. The scar tissue forming these pits, "sphincter dimples," is seized with a pair of tissue forceps, drawn well out and cut away, taking care to expose the ends of the muscle. The rectovaginal septum is then pared off down to and including the edges of the rectal mucosa, after which the sides of the torn perineum and lateral sulci are denuded, according to the technique of Emmet's operation for incomplete tear.

The next step is of equal importance and doubtless is the main thing securing success of this classical piece of autoplasty. The left-hand end of the lacerated sphincter muscle is drawn out of the sheath and a silver wire suture passed through the skin well to the side of the anus, then through the body of the sphincter muscle well back of its left-hand end, then penetrating deeply the posterior part of the perineum, taking in the edges of the levator ani muscles, makes a complete circuit of the rectovaginal septum, going high enough to reach the superior angle or extreme end of the tear in the rectum. It then returns in reverse order, again going through the sphincter muscle well back of the right-hand end as it is drawn out of its sheath, and emerges on the right of the anus at a point corresponding to the place of entry. The ends of the wire suture are then drawn across to opposite sides and the parts momentarily closed as a test. If the ends of the sphincter approximate accurately or butt together like two pieces of the rim in a wagon wheel, a second suture is introduced in a similar manner, but a little higher. The space between the two should not be more than a fourth of an inch, as both sutures should pass through the sphincter muscle.

But if on temporarily approximating the parts the ends of the muscle do not come together as above described, but meet at an acute angle

PLATE XII.

Perineal denudation is outlined and flap dissected from above downward and turned into the rectum.

as two mitred pieces of wood, the second suture should be inserted a little farther back than the first one in order to force tissues from the upper lateral sides of the anus to its anterior margin for the purpose of driving the ends of the sphincter backward toward the centre of the anus, reproducing its concentric shape. Twisting the sutures together closes the rectum completely, then the remainder of the operation is completed according to the technique of Emmet's operation for incomplete laceration.

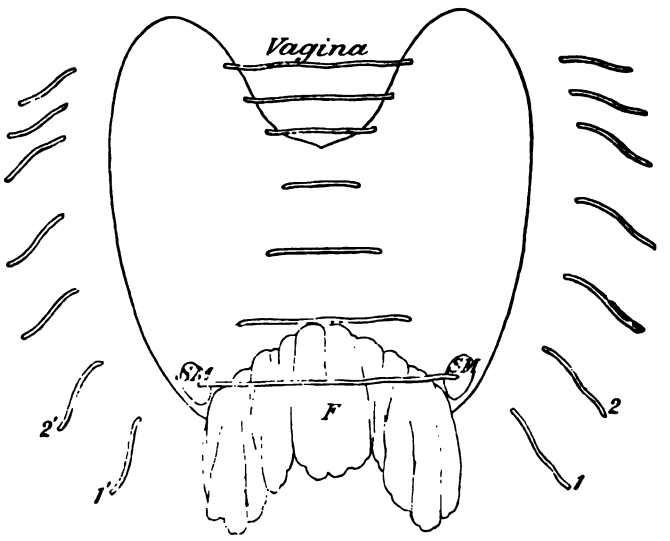
APRON OPERATION.—The apron operation (first proposed in *Boston Medical and Surgical Journal*, January 5, 1878) was devised by J. Collins Warren, of Boston, published accounts of which appear in the *Transactions of the American Gynecological Society*, 1882. On May 11, 1899, C. E. Ristine,[1] of Knoxville, Tenn., and on the 24th of the same month Howard Kelly read papers embracing the principles of this operation. The operation was original with each of them, and neither seemed to have any knowledge of its earlier publication.

Warren's Technique.—"The principle of the method described in this article consists in shutting out the rectum entirely by a flap operation so that it shall no longer enter as an element to be considered in the healing process. The materials of which the flap is composed is that usually cut away by the scissors, and consists of vaginal and vulvar mucous membrane, and also of a certain amount of cicatricial tissue which is to be found at the margin of the rent. The flap is formed by dissecting the 'butterfly' from within outward, preserving the materials just mentioned in one continuous mass, the pedicle being formed by the entire free margin of the septum, a hinge on which the flap is swung over so as to exclude the rectum from view. The dissection will be performed with greater ease and nicety if the knife is used, and should be made chiefly from the sides in the manner indicated in Plate XII. In reflecting[2] the central portion it is important to avoid 'button-holing;' and for this purpose it is well to keep the septum between the thumb and forefinger of the left hand, liberating the flap by gentle strokes of the knife to and fro, while the tissues are made tense by traction on the flap with the forceps in the hands of an assistant. The dissection should stop just short of the free margin so as to leave it intact, otherwise the pedicle of the flap would be severed; on the sides the dissection is carried down sufficiently far to expose the ends of the ruptured sphincter muscle. We have now not only the customary butterfly, but, in addition, a twin butterfly hanging from its lower edge and forming a sort of apron (Fig. 125). A portion of the vaginal and vulvar mucous membrane has been folded over as in turning out one side of a hat-lining, and the vaginal membrane becomes now a portion of the flap, continuous with the anterior rectal mucous membrane. The bowel now terminates in a sort of fimbriated extremity. This flap is redundant not only in length but in breadth, and must, therefore, be thrown into longitudinal folds and be pressed downward, while the twisting of the first stitch

[1] American Journal of Obstetrics, March, 1900, p. 365. Dissecting.

(a wire suture) brings the divided ends of the sphincter together over it. After the remaining stitches have been taken we find the end of the flap still projecting at the anterior margin of the anus. It is well not to trim this off short, as subsequent retraction will draw a considerable quantity of it into the rectum; on the other hand, if all is left, the flap is unnecessarily long and the tip of it is liable to slough. It can be disposed of by folding it in longitudinally, as when we pinch the lower lip together between the thumb and finger, and stitching the apposed raw edges; or it can be spread out in a fan shape and adjusted to a short, curved incision through the edges of the skin at the bottom of the wound. When the flap has been formed and allowed to drop down over the rectum, the cavity of the bowel is no longer seen, and in finishing the

FIG. 125



Same as Plate XIII., with sutures in place.

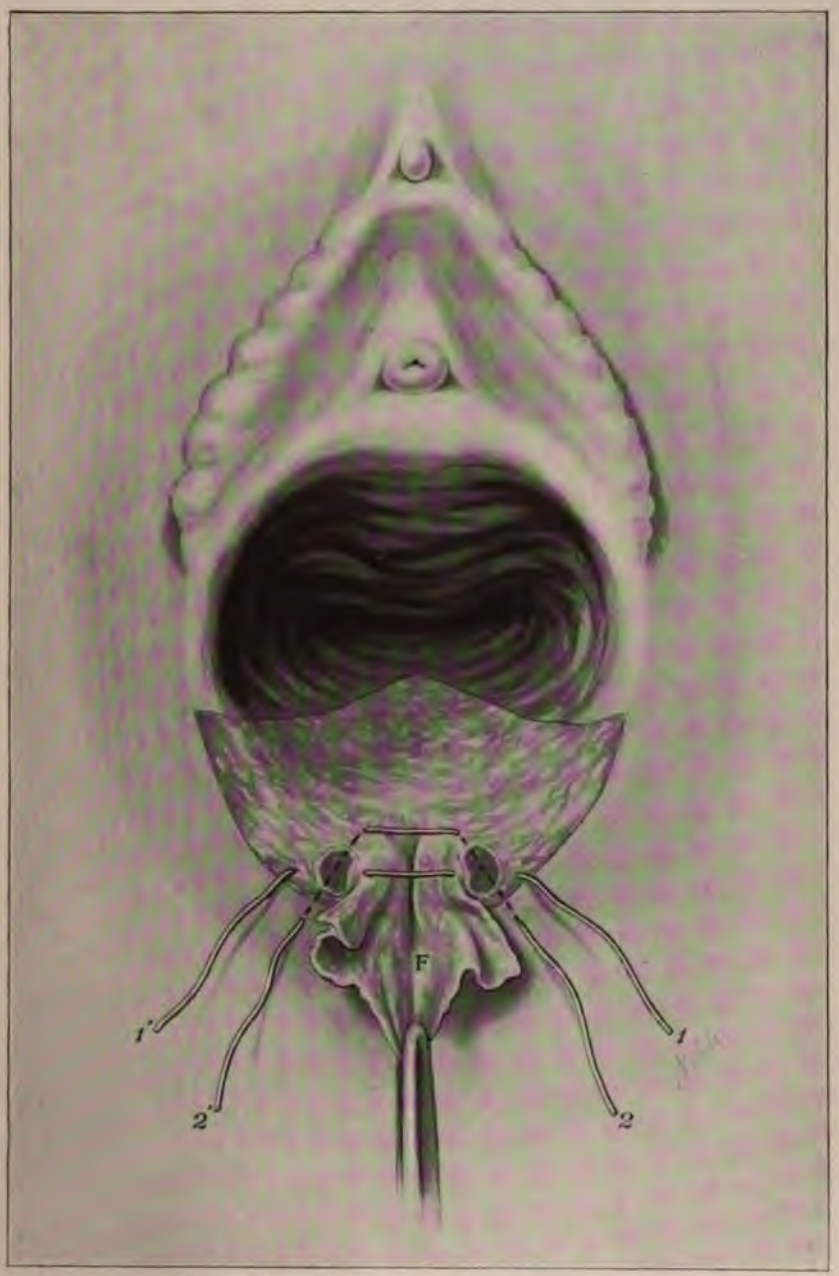
operation we have a problem almost as simple to perform as the formation of a perineum when the sphincter has not been ruptured."

He then sutures very much after Emmet's method, but the deep sutures are so arranged as not to touch the flap or septum that may have free play to assume its normal position, or that the flap may not be so constricted as to endanger its vitality.

Kelly and Ristine place great stress upon uniting the ends of the sphincter muscle with buried catgut sutures. The wire sutures used by Warren may be displaced with silkworm or the perineum closed with buried animal sutures; however, for safeguard two silkworm sutures behind the ends of the sphincter muscle (Emmet sutures) should be used.

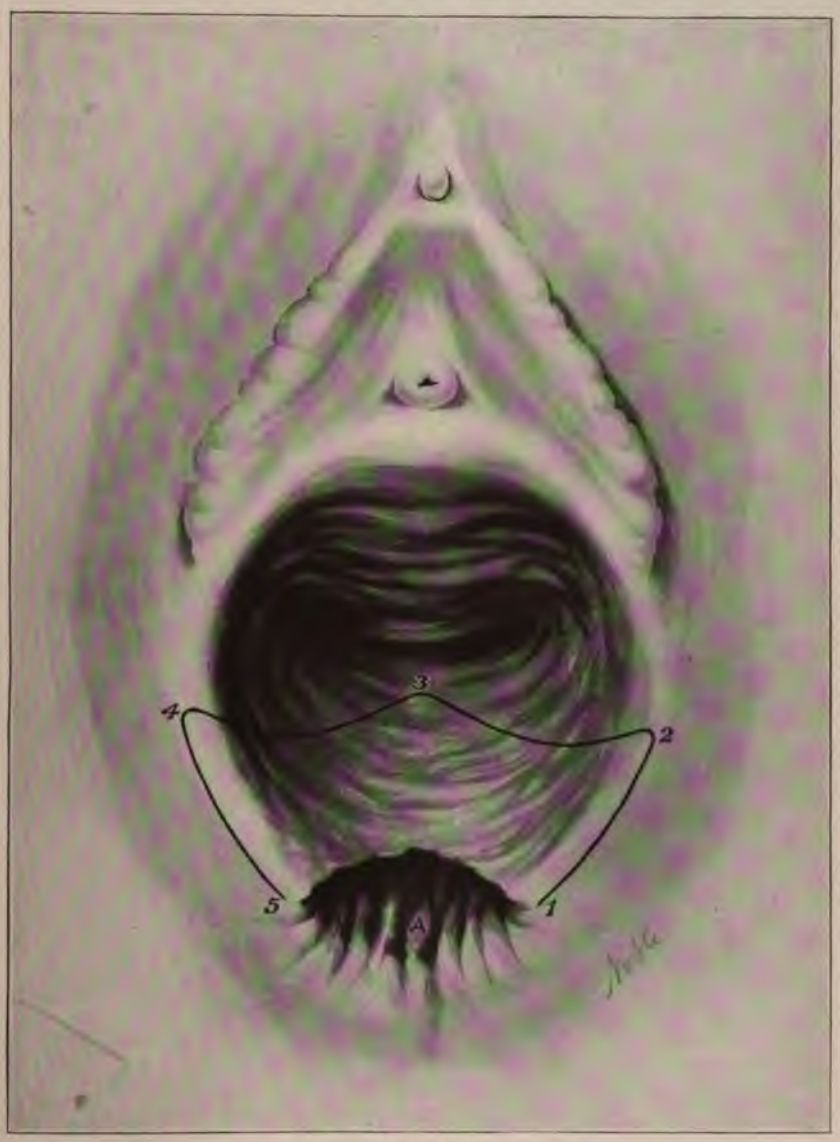
The chief drawback to this operation is that it is not applicable to

PLATE XIII.



Same as Plate XII., with flap turned into rectum and tension sutures in place. (Illustration after Ristine.)

PLATE XIV.



Apron Operation.

Ristine's line of incision. 1, 2, 3, 4, 5. Outlines of flap. A. Anus.
(Illustration after Ristine.)

tears extending very high up in the vagina. The distance above the superior angle of the tear must exceed the depth of the laceration, or the surface on the posterior vaginal wall will be insufficient to cut a flap long enough to extend outside of the anus. And it turns cicatricial tissue into the rectum, where it becomes subject to more or less constant irritation.

After considerable study of this operation I gave it up in the early part of my professional career on account of this reason, but I concede that when properly done it is effectual in shutting off the rectum from the perineal wound, in cases of minor tears.

Other Operations for Complete Tears.—HILDEBRANT denudes the sides of the perineum and edges of the rectovaginal septum and posterior vaginal wall to an angle above the perineum, making a more or less trefoil appearance.

The rectal margins are closed by sutures tied in the rectum, while those in the upper portion of the vaginal wound are tied in the vagina. The principal sutures pass through the perineum, entering on the skin surface, emerging upon the vaginal mucous membrane, cross to the opposite side, penetrate the vaginal mucous membrane and emerge upon the skin. When secured the wound closes closely, leaving no pockets.

Silk is frequently used for the rectal stitches, leaving the ends long to aid removal. Silkworm, however, is less subject to infection and causes but little irritation if both ends are brought outside the anus. Catgut may be used in the vagina while the perineal sutures should be silkworm or wire.

MARTIN makes the ordinary denudation, but closes with what he calls superimposed layers of sutures. He begins at the highest point in the vaginal denudation and sews down to the anus, closing the rectal margins with continuous sutures of catgut. Above this he places one or more layers of sutures, which necessarily become buried as the wound is closed. If the sutures are placed too closely together or drawn too tightly, they strangulate the tissue or so impair its vitality that it becomes susceptible to infection from the rectum. Such is the observation of the writer.

LAUENSTEIN endeavors to overcome the liability of infection from the rectum by closing it with a row of buried sutures, none of which enter the lumen of the rectum at any point. He also closes the vaginal margin in the same way, and finishes with deep sutures through the perineum from the skin surface.

MARCY uses Tait's incision, and draws the edges of the rectum together with the cobbler's stitch of kangaroo. This method of suturing makes a mechanically close seam, but in the hands of one inexperienced with it, strangulation of the included tissue may occur. In the hands of Marcy, who knows just how tight to draw the strands of kangaroo, it has proven successful.

HEPNER uses a figure-of-eight stitch in the rectovaginal septum in place of the tension sutures of Emmet. It is useful in deep lacerations

when a single or circular stitch cannot shorten the distance between the superior angle of the tear and the perineum sufficiently to prevent fecal percolation.

HARRIS, M. L.,[1] calls attention to laceration of the levator ani muscle and describes the effect of tears extending through its edges or the puborectal portion. Such injuries are not common, but they do occur more often than is generally supposed.

He proposed excision of the scar tissue between the ends of the torn muscle and in cases with marked relaxation, resection of the muscle. The operation is intended as an adjunct to perineorrhaphy.

The muscle is exposed as follows: "An incision is then carried up each lateral wall of the vagina from 3 to 5 cm., a little posterior to the centre. The vaginal wall is raised in a flap each way from the incision. The edges of the muscle can now usually be felt and an incision parallel therewith is made through the perivaginal connective tissue, exposing the muscle, which may be easily dissected out with the handle of a scalpel, blunt dissector, or the finger ventrally, as far as the symphysis and dorsally until it curves around posterior to the rectum. Should the muscle have been so ruptured and its ends so retracted that its edge cannot be distinctly felt, the incision is made along the line which the muscles should occupy, and careful dissection made for separated ends. The ends of the muscle will be found connected by cicatricial tissue.

"In width or distance laterally the muscle may be dissected from 3 to 5 cm. When it has been well freed, forceps should be placed on either side of the portion to be resected, so that the ends when cut should not retract out of reach. The portion resected should correspond to the point of laceration if found, or when no distinct separation is found, to or about the centre of the muscle. The extent of the piece resected will depend upon the amount of separation or the degree of lengthening and relaxation. It should be sufficient, so that when the ends are drawn together the floor of the pelvis will be restored to its normal position and degree of tension. The ends of the muscle are then sutured together with an interrupted or continuous catgut stitch, which, of course, remains buried. The opposite side is treated in a similar manner when the incision in the lateral walls of the vagina are closed with a catgut suture."

If the dissection is done within the sheath of the muscle, that is, between the rectovesical and deep pelvic fascia, the cicatricial tissue between the ends of the torn muscle should not be entirely removed, but a little strip should be left to prevent the suture from tearing out; however, the dissection of the muscle is done on the outside of the sheath, leaving it in contact with the levator ani; all cicatricial tissue may be excised. Then if the sutures pass through the two layers of fascia just mentioned, they will prevent tearing out of stitches.

Exceptionally, the muscle is torn away from its pubic attachment,

[1] American Gynecological and Obstetrical Journal, March, 1900.

making a lesion that is difficult to repair. In a case of this kind I found the puborectal and pubococcygeal portion of the muscle completely separated from the pubic bone and its covering. The muscle retracted to a plane on a level with the rectum, and the intervening space was filled with an enormous mass of cicatricial tissue. It being impossible to anchor the muscle to the pubic bone, a portion of the cicatricial mass only was cut away, leaving a strip attached to the pubic bone and another crossing the ends of the muscle to prevent the sutures cutting out.

The retraction was so great that approximation of the two parts was difficult, and before it could be accomplished extensive separation of the muscle from its covering as far backward as the posterior portion of the rectum was necessary.

After considerable work dealing with surgery of the levator ani muscle, I feel constrained to caution those who are not familiar with it against rough or careless handling, for the muscle is delicate and very susceptible to injury, the fascia is easily torn and persistent bleeding may be difficult to control in cases requiring extensive dissection.

Choice of Operations.—In incomplete tears without rectocele, Emmet's denudation fills all indications, and his method of suturing the sulci on either side of the rectum has the endorsement of the profession in this country, but his method of treating the levator ani muscle does not conform to the ideas of many operators. In the first place they will not grow together in the median line unless they are uncovered. It is necessary, therefore, to open the sheath of the muscle on both sides in order to bring them in direct contact. Emmet's operation, therefore, does not represent the acme of perfection in cases that have the levator ani muscle involved, but for median tears of the second degree where the levator muscles have not been separated from the rectum it is an admirable method.

In cases of this class with rectocele I share the opinion of C. P. Noble, that the rectocele should not be anchored to the crown of the perineum, and even go farther in recommending that the entire thickness of the vaginal wall be paired off of the prominence of the rectocele, and that the edges of the posterior vaginal wall with its sheath be closed in front of the protruding rectum, making as near as possible an anatomical readjustment of the parts. This is exactly the thing Emmet does in the lateral sulci; if it is needful there it must also be useful at the weaker point.

In complete lacerations the Emmet tension sutures passing through the ends of the sphincter muscle have proven successful, having but a small percentage of failures, especially in tears that do not extend high up the rectum. They tend to shorten the depth of the tears, drawing the superior extremity or angle downward toward the anus. This feature is noticeable in Tait's H operation, his success being dependent upon the same principle, for the small rectal flap left hanging loosely in the anus is insufficient to shut out infection. For this reason and for the fact that Tait's operation is not based upon the idea of anatomical repair Emmet's operation is preferable.

Tait's operation does not meet the requirements of natural anatomical approximation, which must be made to secure the best results. No attempt is made to repair vaginal laceration nor to approximate fascia and muscle. Its best uses are confined to slight median lacerations that do not cause much discomfort.

The operations that are most satisfactory are those that effectually unite the several layers of fascia edge to edge and secures end-to-end union of the puborectal portion of the levator ani muscles. There are several methods of fascia suturing, among them are Reed's, C. P. Noble's, Bovée's modification, and the writer's operation.

In deep tears Hepner's figure-of-eight stitch adds an additional degree of safety.

Warren's apron operation prevents infection from the rectum, but has the objection of limited application; that is, it is not practical in deep lacerations.

The Noble operation is easier done in deep tears than in slight ones and is satisfactory in either case.

When there has been a great loss of tissue and the two sides of the perineum cannot be drawn together anatomical restoration may be impracticable. Then an extensive Tait H operation is exceedingly useful, as the tissues on either side of the anus can be turned around the front of the rectum to fill in the gaping cloaca.

REPAIR OF SPHINCTER ANI MUSCLE.[1]

Emmet operated on a case where the sphincter ani muscle had been torn obliquely backward near the coccyx, but without injury to the perineum. He dissected out the scar tissue with scissors, extending the incision into the rectum, and closed with carbolized silk sutures, some of which were inside the rectum.

He was also first to call attention to the importance of uniting the ends of the muscle in complete laceration of the perineum and gave to us a landmark for recognizing the ends of the retracted muscle, the "sphincter dimple." His method of uniting the ends of the muscle is given in "Emmet's Operation for Complete Laceration of the Perineum."

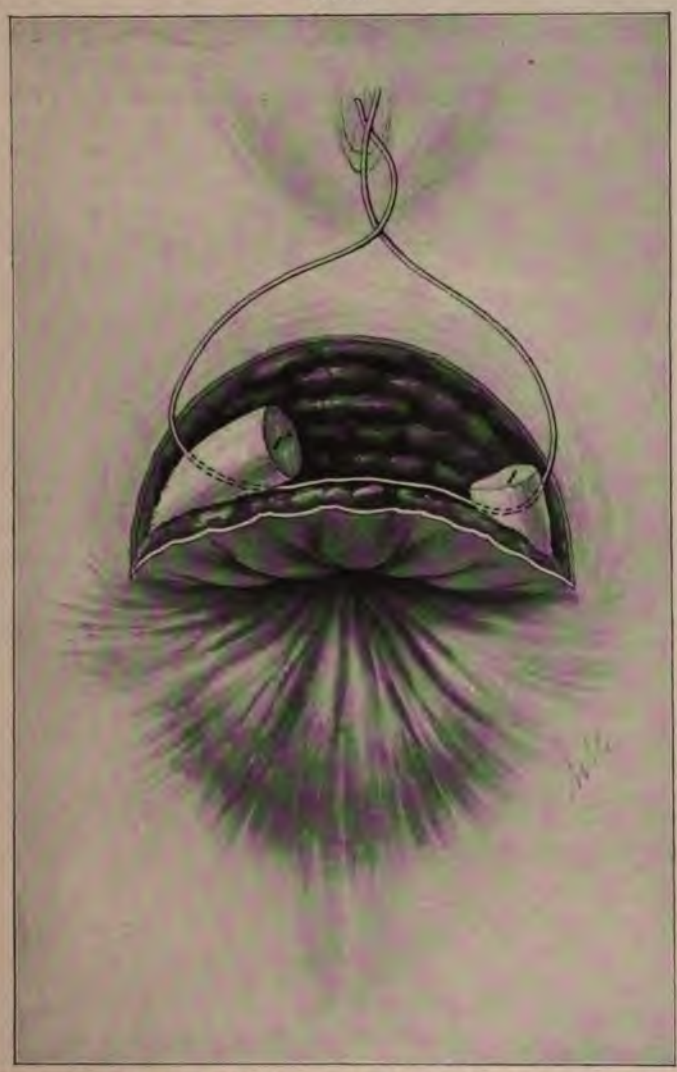
Kelly beautifully illustrates a method of uniting the ends of the sphincter ani in a woman who consulted him for incontinence after having had an apparently successful operation for complete laceration of the perineum. He made a semicircular incision around the anterior margin of the anus just outside the border of the sphincter and deflected the skin outward. By dissecting and gradual extension of the incision he succeeded in finding the fibres of the muscle and isolating its ends, which he united with three buried catgut sutures. The skin was then replaced over the muscle and closed with fine silk (Fig. 126).[2]

[1] Emmet. American Gynecological Society, 1883, p. 203.

[2] Transactions of the Southern Surgical and Gynecological Association, 1898, p. 80. For priority see discussion of same.

Before starting the incision the verge of the anus should be carefully palpated to locate the sphincter muscle lest unnecessary cutting should be done. Beginning at the rear or to one side of the anus and rolling

FIG. 126



Suture of sphincter ani muscle. Ends of muscle (1 and 1') are brought together with two or three buried sutures. Incision in the skin is then closed with fine silk. (Kelly.)

the muscle between the thumb and fingers as they are gradually worked forward on each side, its ends can be easily located, unless the muscle is displaced very far to one side. In that case the incision should start

at the point to which the muscle is traceable, and its ends located by following in the direction of the fibres of the muscle.

In Kelly's case the long end of the muscle was turned upward and outward somewhat in the direction of the tuberosity of the ischium. The end of the muscle in a case that came to the writer for secondary operation was firmly embedded in the scar tissue on the side of the torn perineum for the distance of an inch, and when dissected free resembled a finger-like projection attached to the verge of the anus.

The projecting end of the muscle must be preserved, and if the sheath on the opposite side is open, as it will be in primary lacerations, it should be replaced within the cavity of the sheath. This is done by passing a long suture through the cavity of the sheath; then transfixing the end of the muscle, it returns through the cavity of the sheath close to the starting point in the margin of the anus. Tension upon the suture draws the muscle within the sheath. The suture may be either silkworm or buried catgut. If the latter is used a small incision should be made to the lower end of the sphincter muscle near the bottom of the cavity of the sheath. This incision is closed after tying approximating sutures in the muscle. (See Fig. 102, under Perineorrhaphy.)

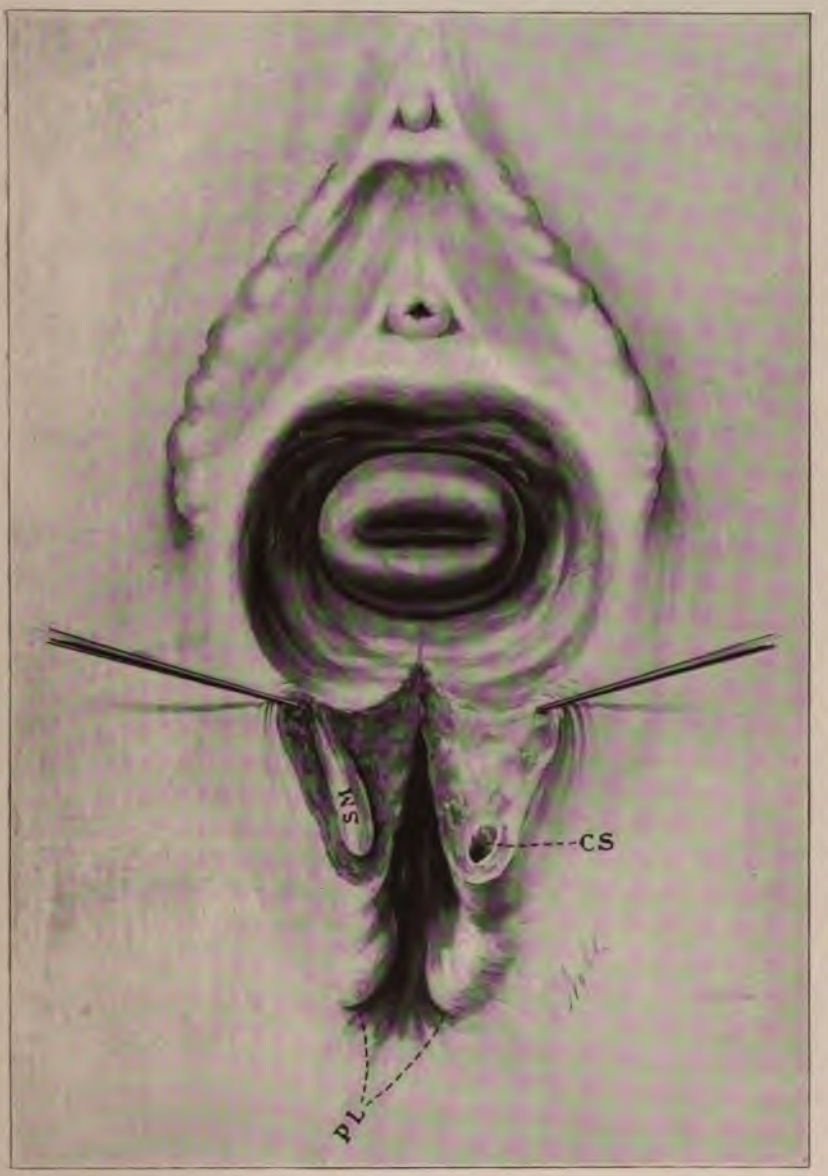
If the cavity of the sheath is obliterated by granulation it must be opened by a curved incision around the outer margin of the anus, and after uniting the ends of the muscle the skin is closed with fine silk.

If plain catgut sutures are used in the muscle, the sphincter should be thoroughly stretched before they are placed or two silkworm gut stitches should be passed through the skin and behind the ends of the sphincter after Emmet's method in complete laceration of the perineum.

The latter has proven most satisfactory in the hands of the writer, several cases with plain catgut sutures only having failed to unite perfectly.

The case represented in Plate XV. had anterior and posterior laceration of the sphincter muscle and is presented here as an illustration of rare form of laceration.

PLATE XV.



Double Laceration of Sphincter Ani Muscle.

S. M. Projecting portion of muscle embedded in scar tissue on side of torn perineum.

C. S Obliterated cavity of sheath.

P. L. Posterior laceration.

Between P. L. and C. S. a short section of the muscle remains in its sheath but completely separated from the main portion of the muscle S. M.

CHAPTER VIII.

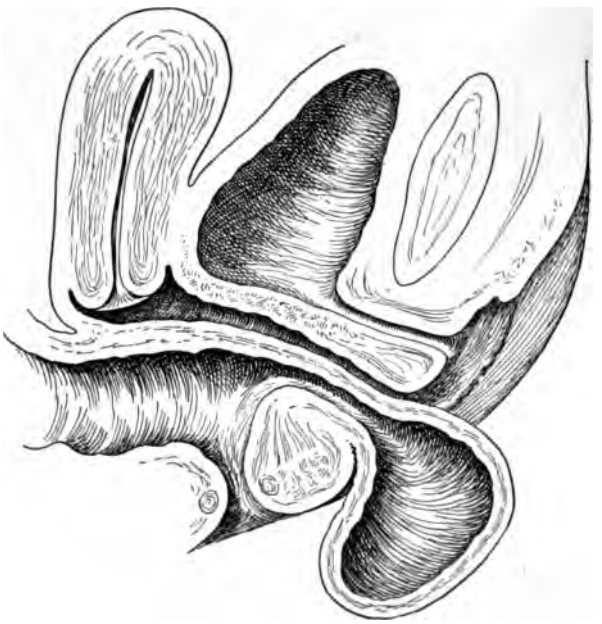
DISEASES AND INJURIES OF THE VULVA AND VAGINA.

By GEORGE H. NOBLE, M.D.

RECTOCELE.

Definition.—Rectocele is a protrusion of the anterior rectal wall through the ostium vaginæ. Slightly prolapsed conditions of this part of the rectum are not regarded as true rectocele. We understand, therefore, that the latter term implies an extrusion of sufficient extent to form a tumor-like projection. They usually grow to the size of an

FIG. 127



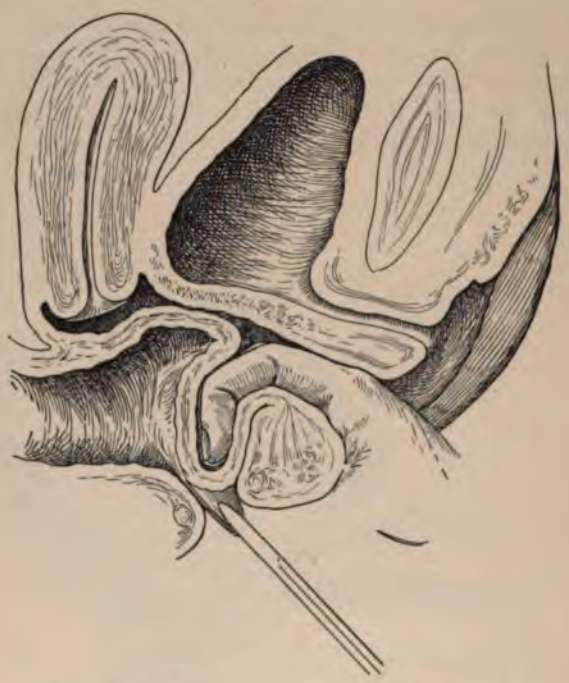
Large rectocele.

ordinary hen's egg, but may attain enormous dimensions. Dr. C. G. Giddings, of Atlanta, Ga., described to me a case of his in which the rectocele was fully as large as the bag of a two-quart fountain syringe. This, of course, was a neglected case and shows to what extent they may grow if not relieved.

The general consideration of rectocele is inseparable from lesions of the pelvic floor, as there is a community of interest in the etiology, pathology, and surgery of both. It is needless to add more but to emphasize the necessity of proper repair.

A small rectocele is usually cured by perineorrhaphy, especially operations that repair lacerations of the vagina. An extensive rectocele is frequently imperfectly relieved in that way from the fact that denudation over the prominence of the rectal protrusion is insufficient in extent to secure obliteration of the sac, or the rectocele is not drawn sufficiently low to become blended with the posterior wall of the perineum.

FIG. 128



The denuded rectocele is everted through the anus.

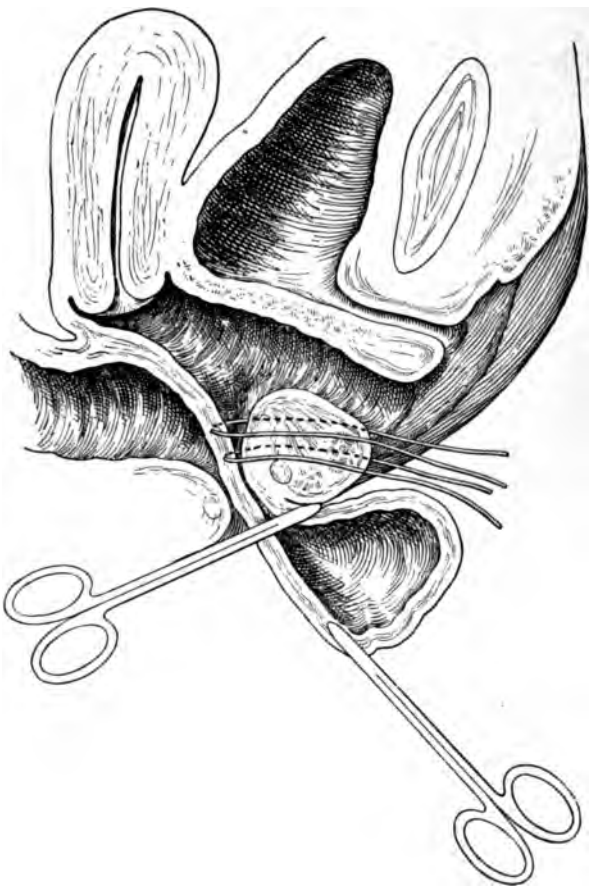
Treatment. MARTIN'S OPERATION.—For cases of this kind Martin denudes the entire surface of the rectocele, folds it in upon itself and secures it by superimposed layers of catgut sutures, the last of which unites the edges of the vagina and its sheath in front of the rectum. The redundancy of tissue, therefore, is tucked together and forced into the lumen of the bowels.

I have combined Martin's method of treating rectocele and Emmet's perineorrhaphy with satisfactory results, but in recent years it has been my custom to make an extra anal resection of the rectocele, the object of which is to completely remove all stretched and relaxed tissue and

bring the normal rectum down to the perineum, which ensures stability that is unquestionable in my mind. The technique is as follows:

NOBLE'S OPERATION.—The vagina is denuded over the rectocele, taking care to cut away all tissue down to the rectovaginal interspace (Fig. 127). This necessarily removes the overstretched portion of the vaginal walls and its sheath. The rectocele is then everted by passing

FIG. 129



After securing the rectocele with a clamp the normal rectal wall is stitched to the posterior surface of the perineum and the anterior margin of the anus.

two fingers into the vagina and turning the anterior rectal wall out through the anus (Fig. 128). It is then caught with compression forceps and drawn out until the thin part of the wall is pulled low or near the verge of the anus. In this way the normal rectal wall above the rectocele is drawn down to the level of the rectovesical fascia. The rectocele protruding from the anus is secured by placing a clamp on it close to the bowel (Fig. 129). If there is doubt about the normal part of the rectum

coming as low as rectovesical fascia, the rectum is still further separated from the vagina by dissecting backward and around on both sides of it in the rectovaginal interspace, and more of the anterior rectal wall is drawn out through the anus and secured in the clamp. The excess of the vaginal flap is cut away, leaving enough tissue to meet in front of the rectum without tension. The perineum is then denuded and two sutures of silkworm gut passed through the lower angle of the perineum, just in front of the sphincter ani muscle, after the manner described by Emmet in the introduction of his tension sutures. They should penetrate the sides of the perineum deeply, and in passing across to the opposite side secure the anterior wall of the rectum to the posterior surface of the perineum in the region of the sphincter muscles. The vaginal flaps are then brought together, with a buried layer of continuous catgut, to the level of the rectovesical fascia. The remainder of the wound is then closed after the method described in my operation for incomplete laceration of the perineum. Dissect the mucous membrane of the anterior margin of the anus in a similar manner to Whitehead's operation for hemorrhoids, and after cutting away the excess of tissue, stitch the edges of the mucous membrane together, making a semicircular line of sutures on the anterior margin of the anus.

The bowels should be constipated for a few days or until the parts can be firmly fixed by process of repair.

I have tried this plan of treatment as an adjunct to perineorrhaphy, and, therefore, never consider it as a special operation. For large rectocele it has been most satisfactory in my hands, but in small rectocele I do not recognize the necessity of such a measure.

CYSTOCELE.

Definition.—Cystocele is a protrusion through the ostium vaginæ of the floor of the bladder and anterior wall of the vagina, forming a tumor-shaped mass. Prolapse of the floor of the bladder is not regarded as cystocele until it reaches a size sufficient to project external to the caruncule myrtiformes.

General Consideration and Causes.—The bladder is loosely suspended in the extraperitoneal cellular space between the horizontal rami of the pubic bones and the vagina. Its neck is firmly fixed to the pubic arch by two layers of fascia, known as the suspensory ligament. The trigonum is closely attached to the vagina, the interspace between the two being practically absent, has an increased thickness over other parts of the bladder and is strengthened by lateral muscular and fascial attachments, which reinforces the parts lying directly over the vaginal orifice and fortify it against the point of least support. The posterior wall is loosely attached to the uterus, while the superior wall hangs free, being supported only by reflexion of the peritoneum from the round ligaments and abdominal wall. It, therefore, is capable of greater distention than any other part of the organ, and is also susceptible of

invagination into the concavity of the floor of the bladder when subjected to much intra-abdominal pressure.

The bladder is protected by a thin layer of fascia projecting upward from the rectovesical layer. It is susceptible of considerable mobility and consequently affords only a limited support.

In collecting urine the bladder dilates more or less eccentrically, the upper parts stretching more than the base; the latter, however, takes part in the process of enlargement. When filled with urine and under the effect of intra-abdominal pressure from straining the bladder has a tendency to force its inferior wall against the vagina, and to protrusion of the part overlying the vaginal orifice. When empty the same tendency is evident, but to a less degree, the superior wall invaginating as above described.

In health it is well protected against protrusion through the ostium vaginæ, but in diseased conditions incident to relaxation, laceration of muscles of the pelvic floor and to uterine displacements, the size of the vaginal outlet exceeds that of the protected area of the bladder, which, meeting with little resistance, gradually extrudes from the vagina.

As the cystocele grows the muscular fibres in the bladder separate, forming trabeculæ of greater or lesser dimensions. In the trabecula or spaces between the muscular bands, the bladder is thinnest, consisting of vesical mucosa, connective tissue, fascia and thinned vaginal walls. The larger the cystocele grows the thinner the parts become and wider apart are the muscular fibres separated, and resistance decreased. Relaxation of uterine supports and prolapsus originally contributing to this condition are increased by being pulled downward by the bladder and vagina. In this way the mechanism of cystocele proceeds, being influenced also by the state of the general health.

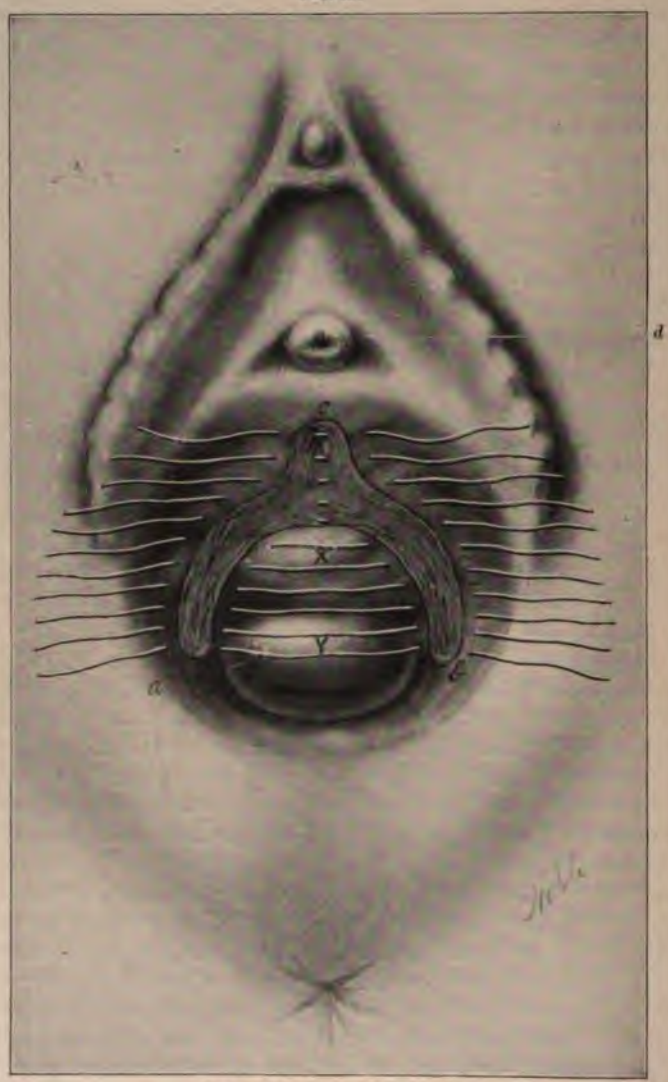
Repair of cystocele, therefore, requires attention to all of the contributing causes—such as the cure of chronic uterine diseases, correcting uterine displacements, taking up relaxed supports of uterus and other pelvic organs, repair of injuries to the pelvic floor, and resection or reduction of the thinned parts of the cystocele, especially in the region of the trigonum.

Cystocele infrequently occurs in the nullipara, but more commonly in the multipara, the most aggravated cases being in the latter that have received injuries in confinement. In the nullipara there may be no uterine displacement, and, therefore, surgical attention to relaxed tissue of the floor of the bladder and perineum may be all that is required.

Diagnosis.—The diagnosis of cystocele can be confused only with cysts of the anterior vaginal wall. The latter are tense, possessed of a shining surface, and are usually situated a little to one side of the median line. This is due to their development from the Müllerian ducts. They have an elastic feeling, and when replaced retain their rounded form, which cannot be changed or collapsed by catheterization. Cystocele is centrally located, conforms to the shape of the vaginal orifice, is roughened on the surface, is soft, and when filled with urine

fluctuation may be detected. When reduced the rounded form disappears and the mass collapses on evacuation of urine. It is also almost constantly associated with lesion of the pelvic floor and uterine displacement.

FIG. 130



Emmet's operation for cystocele.

Operations for Cystocele. SIMS' OPERATION.—Sims has been given credit for making the first effective effort at repair of this trouble. He endeavored to resect the anterior wall of the vagina and bladder, but the latter slipped from between the blades of the scissors and a denuda-

tion of the anterior vaginal wall resulted; this he closed with wire sutures.

The best results with this method are secured when the vaginal wall, including its fibrous sheath, is resected. Removal of the vaginal mucosa only does not afford ample support to the bladder.

STOLTZ'S OPERATION.—Stoltz made a circular denudation over the cystocele and put in a purse-string suture of silk, the edges of the wound were puckered together into a sort of stump, which, with the resulting scars, add thickness to the thinned part of the vaginal wall and bladder. Reliance is placed solely in excision of the anterior vaginal wall. It therefore becomes the main support of the bladder in these two operations. The result is frequent recurrence of the cystocele.

EMMET'S OPERATION.—Emmet[1] makes a V-shaped denudation with the bottom of the V lying over the neck of the bladder and the two arms extending upward on either side of the vagina to a plane a little above the cervix uteri. In this way a more or less rounded patch of mucous membrane is left in front of the cervix and between the arms of the V. The raw surface is represented in Fig. 130 by the letters *a b c; d* is the meatus and *Y* the cervix.

Two sets of sutures are used, the first pass under the denuded surface of the lower end of the wound *c*. The second pass under the denuded surface of one arm (*a c*) of the raw surface then cross over the mucous membrane (*X*) to pass behind the opposite arm (*b c*) of denudation. When the full set of sutures are tied the denudation over the neck of the bladder is closed; the second set bring the two arms in apposition (*a c* to *b c*), folding the slack in the vaginal wall across in front of the cervix and undisturbed portion of the vaginal wall at *X*. This makes a sort of shelf to support the cervix, which lies in the pocket behind the newly made anterior vaginal wall.

Emmet claims good results, but Cleveland in the discussion of Watkins' paper[2] said the majority of his cases (Emmet's method) were successful, and thus a reasonable percentage of failures may be expected.

HANKS' OPERATION.—Hanks[3] reported a case in which he first repaired laceration of the cervix, then opened the abdomen and after scarifying the peritoneum stitched the bladder to the uterus, obliterating a considerable portion of the vesicouterine pouch, using catgut stitches. He then suspended the uterus to the abdomen and later did perineorrhaphy.

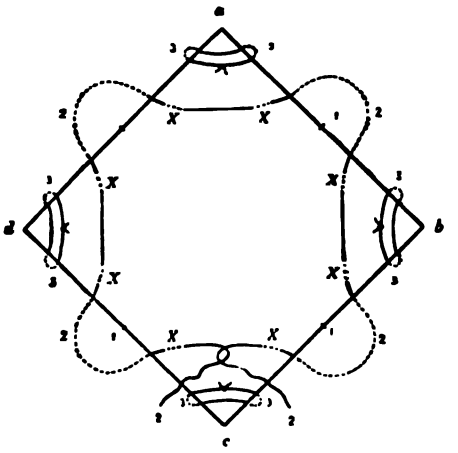
His good result was due to closure of lacerations and to suspension of the uterus; the latter step, making the uterus a more or less fixed point from which the anterior vaginal wall gained its support. Stitching the superior wall of the bladder to the uterus added nothing to the benefits gained through ventrosuspension.

Laroyenne[4] followed this technique except he sutured the bladder to the abdominal wall.

[1] New York Journal of Gynecology and Obstetrics, March, 1893.
[2] Ibid., April, 1895.
[3] Ibid., September, 1898.
[4] Annales de Gyn. et d'Obstet., August, September, 1899.

NOBLE'S OPERATION.—The writer[1] makes a diamond-shaped denudation over the protruding cystocele, which should be outlined in the following manner: With two pair of tenacula the mucosa is picked

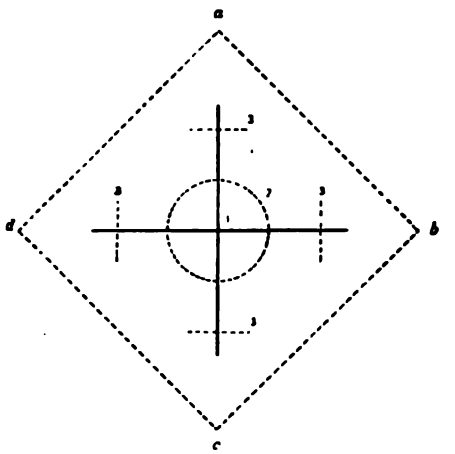
FIG. 131



Noble's operation for cystocele.

up on either side of the vagina, about half-way up the canal and drawn toward the median line. This is repeated until two points are selected

FIG. 132



Noble's operation for cystocele.

that will barely meet or touch when slight tension is put upon them. They are marked by snipping out the pieces of mucous membrane engaged by the hook. In like manner the angles at the base of the

[1] Transactions of the Southern Surgical and Gynecological Association, 1900.

urethra and the one in front of the cervix are marked. A tenaculum should engage the marked point on the right-hand side and sufficient tension made upward to throw the mucous membrane of the vagina into a sharp fold or ridge running from the urethra to the tenaculum. With a pair of scissors a strip of mucous membrane is pared off along the crest of the ridge, cutting through the vaginal wall to the interspace between it and the bladder. This marks the right inferior side of the quadrangle. The hook should then be fixed at the mark anterior to the cervix and a thumb forceps should catch the lateral angle just released from the tenaculum. The two instruments are drawn in opposite directions, forming a fold in the vaginal wall similar to that described above. A strip is removed between the instruments marking the right superior side of the quadrangle. In like manner outlining of the diamond is completed upon the opposite side, after which it becomes an easy matter to remove the island of mucous membrane in strips. All fatty tissue should be removed as far as practicable that it may not interfere with direct contact of the muscular tissue.

Let the diamond *a b c d* (Fig. 131) represent the denuded surface over the vesicocele. Four kangaroo sutures are passed across the the angles at the points *3 3 3 3*, or at a distance from the angles equal to one-fourth of the respective sides of the quadrangle. They should be medium kangaroo, and include all the tissues of the vesicovaginal septum, except the mucous membrane on either side, and be buried deeply. They serve to close the angle of the wound and reduce the field of operation to such an extent that a small purse-string suture can be used.

The latter should follow the lines *2 2 2*, each stitch surrounding the central point (Fig. 131, *1*) of each side of the quadrangle. In passing around the denuded surface, from side to side, deep stitches should be taken in the base of the bladder down to but not including its mucosa at the point marked *X*. When drawn together and tied the sides of the diamond are forced in concentrically (Fig. 132, *1*) in the shape of a cross. The margin of the wound should then be closed with a whip-stitch of fine catgut.

STONE'S OPERATION.—I. S. Stone[1] described an operation in a paper read before the American Gynecological Society in 1902, in which he incised the vagina and separated the bladder from it on either side and from the uterus. He then elevated the base of the bladder and anchored it to the uterus, trimmed away the excess of the vaginal tissue and closed the incision.

The technique is taken from Stone's paper.

Anterior Operation.—"In the anterior operation the wall is incised in the median line, and after clamping the sides of this incision the bladder is pushed upward and backward until the entire base of the bladder is separated from the vaginal wall, and from the anterior surface of the uterus, if desired. We particularly need to extend this

[1] Also American Gynecological and Obstetrical Journal, January, 1900. Werder also advises lifting the bladder up and fixing it to a higher level, and lays stress upon the great importance of ventrosuspension.

separation as far laterally as possible, for we have already seen that the whole pelvic roof shares in the prolapse.

"We proceed now to lift the bladder with fingers or gauze packing, or with a sound inside the organ, as far upward as possible, to assure us of the extent of liberation. The excessively long flaps which presented over the base of the bladder as a cystocele (the distended anterior vaginal wall) are now excised, and the wound brought together, edge to edge, taking care to entirely obliterate the cystocele and to leave the new anterior vaginal wall straight across.

"The method of applying the sutures is important, for we invariably suture the flaps near the centre of the wound to the anterior surface of the uterus with silkworm-gut, silk, or chromicized catgut. This is done for the double purpose of holding the bladder high above the former attachment on the uterus and to hold the uterus forward if it has been retroverted. The bladder is held away and the deep sutures passed through the uterine wall between the round ligaments. The wound is then entirely closed with catgut sutures. It will be observed that the Mackenrodt method of vaginal fixation has been applied to my operation, but it was primarily done to hold the bladder higher upon the uterus rather than to cure the displacement. In very large cystocele the vaginal wall is, of course, greatly lengthened, and we may shorten it by removing a V-shaped section from each side of the incision in front of the cervix. The longitudinal wound in the median line will then join one made transversely across the vagina in front of the cervix."

Kreutzmann,[1] Gersuny, Sanger and others seem to be much impressed with the idea of separating the bladder and uterus and elevating it to a higher plane (Sanger perhaps being the first to make the suggestion). It is apparently becoming recognized as an essential feature in operating for relief of cystocele and I am sure deserves thoughtful consideration, but it alone is insufficient to cure; it is only a link in the chain of operations that are required in so many of these cases.

T. J. Watkins'[2] operation is similar in principle, but he anchors the anterior vaginal wall to the fundus uteri and upper border of the broad ligament.

SUTTON'S OPERATION.—E. M. Sutton describes his operation in the *American Gynecological and Obstetrical Journal*, August, 1901. He makes a triangular excision of the anterior vaginal wall extending deep enough to expose the bladder.

The shape of his lines is triangular with the base at the cervix uteri and apex at the meatus. The base line extends around the cervix to the lateral sulci on either side (transversely) across the anterior vaginal wall to its full limit. From the extremities of this line the sides are marked by extending two lines in the direction of the vaginal orifice. These lines intersect at a point on the urethra near the meatus. The wound is closed from side to side, buried sutures being unnecessary.

[1] American Gynecological and Obstetrical Journal, March, 1900.
[2] Ibid., November, 1899.

Sutton claims there is considerable advantage in increasing the relative length of the anterior vaginal wall, as his line of sutures apparently do.

HIRST'S OPERATION.—B. C. Hirst calls attention to lacerations of the muscle of the urogenital trigonum and refers to Waldeyer's anatomy for description of the muscle. His technique is as follows:

"The anterior vaginal sulcus on the left side is displayed by three bullet forceps making traction at the three angles of the sulcus. As the woman lies in the dorsal position on the table the sulcus is not

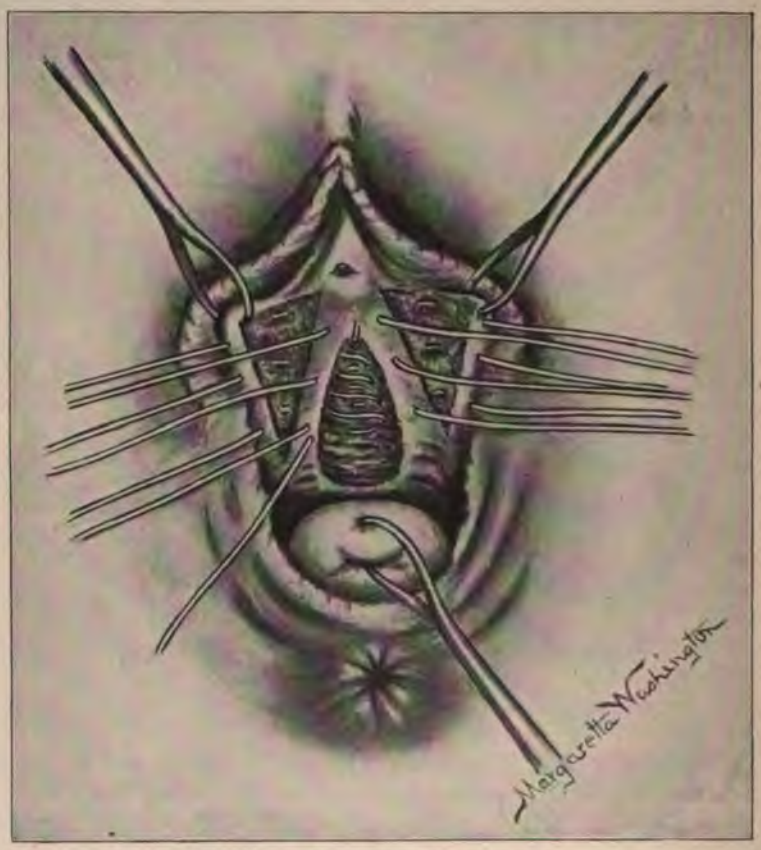
FIG. 133

Hirst's operation. Lateral sulcus is held open with three bullet forceps.

easily accessible and cannot conveniently be denuded, as it lies hidden within the vagina; but by fixing one bullet forceps alongside the orifice of the urethra, another on the opposite vaginal wall, and the third half-way up the vaginal wall at the apex of the sulcus, the triangular area involved in the injury comes plainly into view (Fig. 133). The triangle is marked out with a knife, and the mucous membrane is readily dissected off by scissors in one piece, which takes but a minute or two. The other side is treated in the same manner. Usually the tear is deeper on the left side and may be confined to that side. The sulcus

being denuded, the sutures of silkworm-gut are inserted just as they are in the posterior sulci in an Emmet operation (Fig. 134). They are not yet united, but are clamped temporarily with hæmostats. The cervix is pulled out of the vulva and the rest of the operation is performed in the usual manner for cystocele, with an oval denudation and the buried continuous tier suture of catgut. After the closure of the oval denudation the sulci sutures are united with shot."

FIG. 134



Showing method of introducing sutures.

EDEBOHLS' OPERATION.—In elderly women the supports to the pelvic viscera, as well as the pelvic floor, sometimes become so attenuated and relaxed that almost any operation for cystocele may fail. For such cases Edebohls has devised an operation he calls "panhysterocolpectomy." It consists in complete removal of the vagina with the uterus and appendages and stitching the denuded vagina and rectum together. This must necessarily be effective, but the field of application is limited,

because cases requiring such severe measures are limited, and old women are poor subjects for extensive operation. I would add a word of caution against its indiscriminate use.

These are the new operations for cystocele, the most important features of which are fixation of the neck of the bladder and repair of the muscles of the trigonum, diamond-shaped excision of the vaginal wall, cutting deep enough to expose the muscular structure of the bladder, separation of the bladder from the vagina and uterus, and elevating it to a higher plane.

These principles represent the leading features of several operations, but they can be combined into one with excellent results, according to my own experience. But none of them are complete in themselves, for all require the attention to lesions of the floor of the pelvis and uterine displacements.

PROLAPSE OF THE VAGINA.

Etiology.—Prolapse of the vagina nearly always occurs with prolapse of the uterus or procidentia. General consideration of the subject, therefore, is included in the treatment of uterine displacements. Exceptionally, however, the vagina may be prolapsed or everted without such displacements. I refer to cases of hypertrophic elongation of the neck of the uterus where the increase in length of the cervix is sufficient to permit eversion of the vagina without descensus of the corpus uteri. This condition is usually caused by hypertrophy of the vaginal portion of the cervix, fibroid tumors which drag upon the neck of the uterus and injuries of the floor of the pelvis. Either or all of these may act as causes in conjunction with slight forces more or less constantly exerted, or greater forces experienced at repeated intervals.

Treatment.—Treatment for vaginal prolapse is essentially surgical. When due to hypertrophic elongation of the cervix the vagina is carried downward and everted by gradual advancement of the vaginal portion of the cervix.

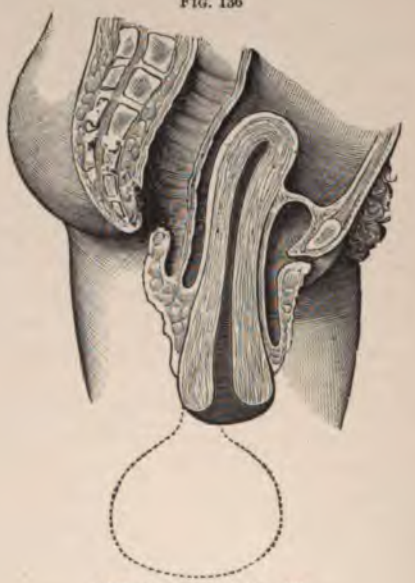
The remedy, therefore, consists in separating the vagina from the neck of the uterus by making a circular incision around it similar to that used in vaginal hysterectomy. It is then further separated by blunt dissection, which should be carried as high as the internal os. The bladder strips off without difficulty, but the peritoneum on the posterior surface of the uterus is liable to be perforated. This may not be a serious injury, as the opening can be readily closed with catgut sutures. The cervix is then amputated as high as possible, preferably to the internal os. If hemorrhage is profuse the uterine arteries should be tied outside the point where vaginal branches are given off. The vagina is then inverted and stitched to the stump of the uterus. If oozing from the stump is persistent it may be controlled either with thermocautery or mattress sutures. The latter should be passed from the cervical canal outward, going through the vaginal wall about an inch from the margin

of the wound and tied upon the mucous membrane of the vagina. The edges of the vagina are sutured to the mucous membrane of the cervical canal with No. 2 catgut.

FIG. 135

Hypertrophic elongation of the cervix uteri, showing tumor and everted vagina before operation.

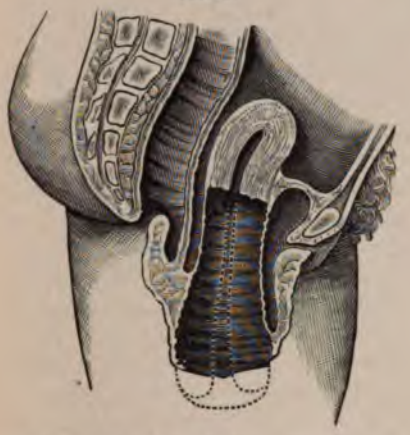
FIG. 136



Mesial section of Fig. 135.

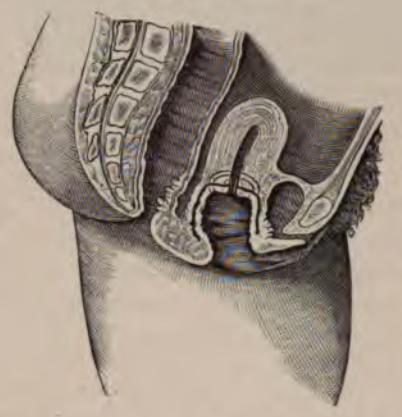
Some interesting cases are recorded in Barnes' *Diseases of Women* and other old works on gynecology. A case of mine beautifully illustrating the operation can be found in the *American Journal of Obstetrics*, November, 1896, reproduced in Figs. 135, 136, 137 and 138.

FIG. 137



Dissection of the bladder and rectum from the cervix uteri and amputation of the latter at the internal os.

FIG. 138



Showing restoration by inverting vagina, rectum, and bladder, and anchoring with mattress sutures in the stump.

VAGINAL ENTEROCELE.

There is another class of vaginal prolapse commonly known as vaginal enterocele. This is a bulging forward of the vault of the vagina beneath Douglas' pouch. The causes are relaxation of tissue, loss of support to pelvic floor, intra-abdominal pressure, etc.

Vaginal enterocele may occur with or without rectocele, but the latter is a predisposing or contributing cause.

Treatment.—The vaginal enterocele or hernia through Douglas' pouch without displacement of the uterus is an extremely rare condition. The operation for its relief consists mainly in obliteration of Douglas' pouch, which may be done by an incision through the vagina and packing with gauze after the method employed by some of the German surgeons for displacement of the uterus, and more recently by Pryor. However, it is not always satisfactory, as there is liability to recurrence of hernia after absorption of the adhesions.

The best method of operating is to shorten the uterosacral ligaments by passing a suture through each of them about its middle portion, taking up the peritoneum in the bottom of Douglas' pouch. When the suture is drawn together Douglas' pouch will be constricted from side to side. If the constriction encroaches too much upon the rectum the suture should be removed and reintroduced a little nearer the uterus and again tested to see if the rectum is not interfered with. If it has

space enough to perform its functions, one end of the suture is then carried through the posterior wall of the uterus on a level with uterosacral ligaments and tied. This will have the effect of drawing the uterus backward and upward and closing the pouch except for a small space in front of the rectum. To prevent a loop of the intestines from slipping into it and becoming strangulated or acting as a wedge, and subsequently destroying the effect of the operation, the pocket is shut off by stitching the rectum to the upper borders of the uterosacral ligaments as far forward as the primary suture. The operation is performed through the abdomen, but can be done through the vagina by slightly modifying Bovée's operation for shortening the uterosacral ligaments.

The main suture should pass upward on one side through the uterosacral ligament, then through the posterior wall of the uterus, next down through the uterosacral ligament on the opposite side and tied in the wound below the peritoneum. The vagina is then closed with catgut. The main sutures shortening the uterosacral ligaments should be kangaroo or No. 2 chromic gut.

The operation, whether done through the abdomen or vagina, is rather difficult and should be attempted only by those who are accustomed to deep pelvic work. If done through the abdomen, the Trendelenburg position can be used advantageously.

POLK'S OPERATION.—Polk,[1] operating through the vagina, opened Douglas' pouch, and after dissecting the peritoneum free from the sac cut it off high up. The edges were then united with catgut. The excess of tissue in the vaginal wall was then trimmed off and closed in the manner of doing posterior colporrhaphy.

Edebohls[2] cured one case by doing this operation, except he did not open the peritoneal cavity.

PUNCTURE WOUNDS OF THE VAGINA.

Puncture wounds of the vagina are not commonly observed and the most that we do see are inflicted in attempts at criminal abortion.

Clinically, they should be divided into two classes—viz., first, those that penetrate the skin of the perineum or buttocks and then the vagina; second, wounds that penetrate the vagina first, then enter the peritoneal cavity, bladder or some other organ.

The first class of injuries are not likely to be serious except for primary hemorrhage and infection.

Those of the second class have in addition to these dangers liability to peritonitis, extravasation of urine, feces, etc., according to the organs injured.

Treatment.—First attention is required as to hæmostasis; this may be done by compresses both in the vagina and on the external wound

[1] New York Journal of Gynecology and Obstetrics, July, 1893.
[2] Ref. Idem.

in the first class of cases. If hemorrhage becomes alarming or uncontrollable by compression, incision and ligation of bleeding parts may be necessary. This, however, is exceptional.

If hæmatoma develops and becomes limited early, the wounds should be protected with antiseptic dressings; but if it continues to grow or later becomes infected, incision, cleansing, securing bleeding parts or gauze packing and drainage will be required.

In puncture wounds of small children and infants very little can be done beside the use of compresses externally and injections of mild styptics in the wound.

Corrosive styptics should never be used. It is not surgical and they often do harm by their destructive action. Iron solutions are especially harmful.

A negro baby, aged eleven months, was admitted to Dr. Cooper's service in the Grady Hospital, June 6, 1904, with a small puncture wound produced by an umbrella rib. The steel rib entered the left buttock about two inches to the side of the anus, passed close to the inner side of the tuberosity of the ischium and entered the vagina. Hemorrhage was severe both from the wound and the vagina, but was controlled by the house surgeon, who injected peroxide of hydrogen (which returned through the vagina) and a solution of adrenalin chloride. This was followed by packing gauze, moistened in the latter solution, into the external wound.

The temperature ran high on the second and third days, but the baby was well enough to be dismissed on the seventh day. No local signs of infection were observed.

In such cases the adrenalin solution is perhaps sufficient. Peroxide of hydrogen injected into punctures, wounds, pockets, and sinuses that do not have free openings or exits is liable to either lacerate the tissue from gas pressure or infiltrate into the fatty tissue, producing an emphysematous condition that may become serious in case of infection.

Wounds of the second class are more serious on account of the dangers above mentioned.

The first service is determination of the extent of the injury. If the peritoneal cavity has been penetrated the question of abdominal section must be considered. If the instrument is very small, such as a knitting needle, temporizing is a conservative measure, unless the instrument inflicting the wound is known to have escaped into the peritoneal cavity, or symptoms of shock from internal hemorrhage appear.

But if the penetrating instrument is large and dirty, such as a grass hook, a shiver of wood, or if shock supervenes, the abdomen should be opened.

Wounds entering the bladder, if small, should have rest, antiseptic protection, and catheterization at short intervals to prevent extravasation or leakage of urine. Large wounds in the bladder should be sutured.

Injuries involving the rectum deserve similar treatment. Penetrating wounds involving the tissues of the broad ligament deserve conservative attention unless a hæmatoma grow very large or become infected. They

should then be evacuated, packed, and drained. If this does not control hemorrhage, gauze packing moistened with diluted adrenalin solution should be tried. It makes a useful hæmostatic dressing in extraperitoneal pockets in the pelvis. As a last resort in extreme cases abdominal section for the purpose of ligating bleeding vessels is justifiable.

LACERATIONS OF THE VAGINA FROM EXTERNAL VIOLENCE.

Such wounds are produced by falls upon sharp objects, like fence-pickets, garden implements, shivers of wood, etc., and also by brutal coition.

The chief difference between lacerated and punctured wounds of the vagina is that other organs are not apt to be involved in the former.

Treatment.—Treatment is the same except that the bleeding points can be more readily secured and the wound sutured. The patient should be placed in the Simon position, the vagina held open with two long, narrow retractors and the lacerated surface compressed with a pad of gauze under the fingers. The vagina can then be cleansed and spurting vessels caught with compression forceps as they appear at the distal margin of the gauze while slowly withdrawing the latter.

Should the patient's condition be extreme or necessary instruments wanting, moist adrenalin tampons firmly packed into the vagina for twelve hours are useful. The wound then can be sutured.

Absorbent cotton squeezed out of strong alum-water and tightly packed in the vagina makes an excellent hæmostatic tampon. It will, however, prevent primary union of the parts unless the surface is thoroughly scraped or pared off with scissors before suturing.

ATRESIA OF THE VAGINA.

Definition.—Atresia of the vagina means occlusion of that canal. Though it implies obliteration of the lumen, the subject is treated as if it occurred in both the complete and incomplete forms; constrictions of the vagina are, therefore, included in this chapter. The former term is applied to occlusion at any part of and to complete obliteration of the vagina. No matter how extensive destructions of the vagina may be, it is classed as incomplete atresia, unless the vagina is imperforate.

In incomplete cases the menstrual fluids drain away, but in the complete atresia they collect above the obstruction and give rise to the distressing symptoms of the hæmatocolpos, hæmatometra, etc.

Causes.—Congenital cases are due to defects in fusion of Müllerian ducts and canalization of the original cellular mass forming the rudimentary vagina (Henry Morris). The upper extremity of the vagina is most frequently involved in the deformity.

In double vagina one side only may be obstructed, sometimes resulting in unilateral hæmatocolpos, which may be mistaken for cystic tumor.

Meyer[1] believes that many so-called congenital cases have their origin in "vulvitis and local lesions in general septic infections," occurring in childhood and infancy. The frequency of vulvitis, vaginitis, agglutination of external genital folds, etc., occurring in early childhood, have a tendency to strengthen this view.

Injuries in confinement are perhaps the most common causes of acquired cases, such as prolonged pressure, sloughing, extensive lacerations, carbolic acid burns (when the acid is not dissolved in the douche water), and other such accidents. Sloughing tumors,[2] syphilitic and rodent ulcers, surgical injuries, extensive cauterizations and foreign bodies should also be enumerated.

Symptoms.—At times the stenosis may be almost complete and cause no symptoms, especially when situated in the upper part of the vagina, such as Boldt's case. She had the upper end of the vagina occluded except for a small pinhole opening, from which pus could be squeezed. Yet the only symptom was occasional skipping of menstruation.[3]

When atresia is complete there may be effort at menstruation, and if the uterus and ovaries are sufficiently developed there will be collection of menstrual fluid, and in extensive hæmatometra, prominence of the abdomen produced by enlargement of the uterus. Absence of menstruation, nose bleeding and colicky pains in the region of the uterus are not uncommon symptoms.

When the uterus and ovaries are absent these symptoms are not to be anticipated, but menstrual molimina is sometimes associated with very small rudimentary uteri.

Diagnosis.—The diagnosis is easy, as this condition cannot be confused with any other. The only distinction to make is between the congenital and acquired cases.

The former give history of prenatal origin unassociated with traumata, and are met with in children and unmarried women chiefly.

Acquired cases occur mainly in married women and follow accidents in confinement. When not due to this cause they may, in a small percentage of cases, occur in single women and young girls, and give a history of some accident or inflammatory affection of the pudenda in childhood.

Preventive Treatment.—In the primary stages or before contraction has taken place, cleansing douches, such as weak bichloride solutions, 1:4000 or 1:5000, permanganate of potassium 1 to 2 per cent., and boric acid solutions are useful to promote granulations. They should be followed by boric acid, iodoform or 10 per cent. ichthyol dressings as protectives and to prevent growing together of the granulating surface where the walls of the vagina come in contact. Contracting bands should be cut as fast as they form, to prevent stenosis.

In my hands the best means of preventing contraction is to dust the raw surface thoroughly with iodoform, then keep the vagina distended

[1] American Practitioner and News, March 20, 1904.
[2] American Journal of Obstetrics, 1897, p. 594.
[3] Transactions of the New York Obstetrical Society, February 2, 1897.

with cotton dressings packed inside of a thin rubber bag. The method of applying it is to slip a rubber bag (condom) over an old-fashioned cylindrical speculum (Ferguson), which is then introduced into the vagina while the woman is in the knee-chest position. Cotton dressings or strips of gauze are packed into the bag through the speculum, and as the dressing is being applied the speculum is gradually withdrawn. Packing should be made as tight as the patient can comfortably bear it, and renewed once in forty-eight hours; but if there are copious discharges, it should be changed oftener. The use of the rubber flattens out the granulations and encourages the growth of epithelium from the edges of the raw surface.

When granulations have reached a healthy stage and discharges are limited, transplantation of mucous flaps from the vulva or skin grafting may be done with fair success. Only a small percentage of the grafts adhere, consequently the operation requires repetition when an extensive surface is to be covered.

Treatment after Contraction or Occlusion: General Consideration.—There may be some doubt as to the course to pursue in certain cases, but the weight of opinion is in favor of doing some kind of an operation.

In congenital cases with menstrual molimina an examination should be made with a finger in the rectum and a sound in the bladder, and if menstrual fluid or a uterus of fair size is found it justifies an operation to make an artificial vagina for the escape of the menses. If the uterus and the ovaries are absent it then is a question for the patient to decide, and as they wish to be as much like other women as possible, they not infrequently request the operation. Unmarried women put it upon this ground, while the married ones say it is for the sake of their husbands.

In traumatic cases married women run the risk of pregnancy in incomplete atresia or of complete occlusion after impregnation. It is, therefore, not a question of drainage and marital relations only, but the condition may become an obstacle to delivery of the fetus, especially in bad cases. In some incomplete cases childbirth is possible. Emmet, McLean, Lee, Nilson and others have reported cases of this kind.[1]

Upon the other hand, A. Veden[2] and others have shown that they sometimes require operative interference even with a vaginal opening as large as five inches in circumference. Veden had to make numerous incisions all round the constricting ring before the fetus could be extracted. Meyer[3] had a similar experience.

When the cicatrix is unyielding there is danger of rupture of the uterus, or when the constriction occurs at the inferior extremity of the vagina the fetus may be extruded through the rectum, as in Zinctrowicz's case.

Unyielding obstructions may require Cæsarean section or even panhysterectomy if drainage through the vagina is defective. B. C. Hirst experienced considerable trouble in a case upon which he did Porro's

[1] Transactions of the New York Obstetrical Society, April 5, 1887.
[2] Medical Record, October 2, 1897.
[3] Cent. f. Gyn., No. 34.

operation. The small amount of discharge from the cervical stump could not escape through the narrow canal that remained in the vagina. This he had to dilate when sepsis became apparent.[1]

E. Leveque did complete hysterectomy for vaginal atresia caused by sulphuric acid burns. The occlusion was so complete there was no room for escape of the lochia.[2]

Prof. Lohlein did Cæsarean section on two cases at the University Hospital in Geissen.[3]

Clarence Webster did abdominal section for collection of menstrual fluids in the vagina, uterus, and tube because he found the rectovesical septum too thin to dissect. His patient died. The method is not to be recommended.[4]

Castration has also been practised, but its approval should be tempered with reluctance, especially if there is hope of establishing a satisfactory vagina. If the uterus and ovaries are functionally active they should be spared; if imperfectly developed the operation is questionable, for it may be possible to subsequently develop these organs.

In Eberlin's case the uterus was the size of a walnut. A uterus of that size is perhaps capable of development in subjects of good physique.[5]

Fletcher, in 1831, and Amussat, in 1832, were the first to evacuate retained menses by "blunt dissection of the rectovaginal septum."

Burrage utilized the nymphæ, splitting them from behind forward and then spread them out on the vaginal walls.

ANNULAR CONSTRICTION OF THE VAGINA.

Annular constriction of the vagina may be treated by excision similar to Whitehead's operation for hemorrhoids. A circular incision is made through the mucous membrane of the vagina, completely encircling the latter on the lower side of the stricture. The edges of the mucous membrane are then grasped with forceps, and, as gentle traction is made, the cicatricial ring is dissected from the vagina all around. When the dissection is completed the stricture is cut away by making an incision completely around the vagina on the upper side of the stenosis. The vagina at once becomes dilated. The edges of the mucous membrane can then be stitched together, dissecting both upward and down if necessary to relieve tension (Fig. 139).

If the incision extends deeply in the walls of the vagina silkworm-gut should be used for suturing material.

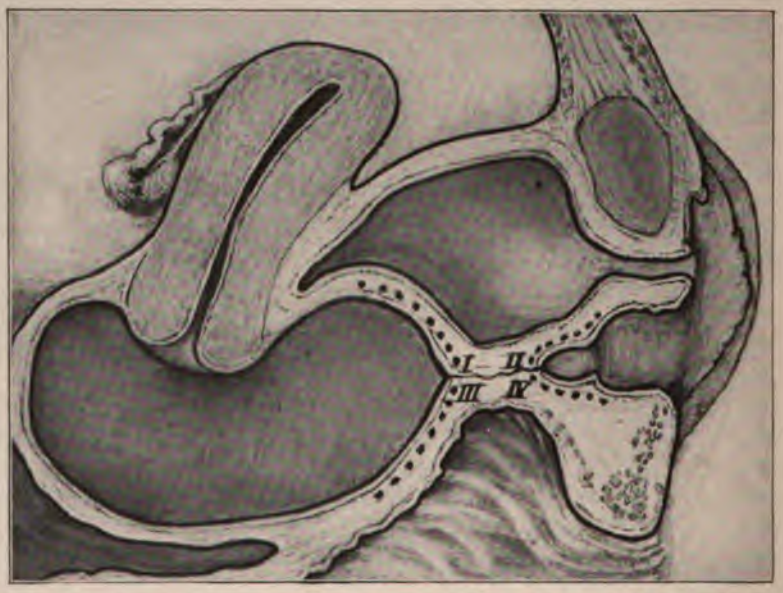
Technique for Irregular and Extensive Stenosis. SEPARATION OF ADHERENT PARTS.—The usual method is to insert the left index finger

[1] American Journal of Obstetrics, February, 1900, p. 211.
[2] Ann. de Gyn et d'Obst., January, 1903.
[3] American Journal of Obstetrics, April, 1894, p. 562. Reported by F. Keyser.
[4] Ibid, October, 1895, p. 544.
[5] American Journal of Obstetrics, April, 1900, p. 553.

into the rectum and a sound in the bladder to feel and guide the scissors in cutting open the vagina.

Frequent examinations of the newly cut surfaces should be made to determine the thickness of the bladder and rectal walls. Palpation with the right index finger in the wound and the sound in the bladder may show the bladder becoming thinner as the cutting proceeds or that mucous membrane only may preserve its integrity; we know then we are encroaching too much upon that organ and should correct the fault by cutting closer to the rectum. Upon the other hand, if feeling the rectum between the two index fingers shows it is becoming too thin, the point of a pair of scissors should be very cautiously turned a little more in the direction of the bladder. Proceed in this way until the

FIG. 139



After cutting through the obstruction between *I, II, III, IV* and removing all cicatricial bands the margins of mucous membrane are stitched together, *I* to *II* and *III* to *IV*. If necessary tension may be relieved by dissecting underneath the mucous membrane, as shown by the dotted lines.

finger passes through the constriction, then the danger of puncturing the bladder is lessened for the reasons that its relation to the parts can be definitely determined and separation may be completed by the fingers.

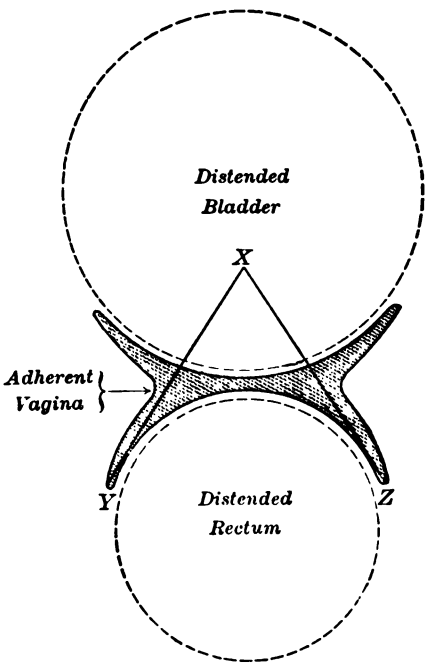
The technique I prefer is as follows: The rectum should be filled with a firm roll of absorbent cotton about one and one-fourth inches in diameter and about six inches long. The rolls should be wound tightly with thread to give it considerable degree of firmness and a string attached to one end to facilitate its removal. It satisfactorily

marks the outline of the rectum and helps the operator to avoid injuring that organ.

As menstrual fluids do not collect in incomplete atresia, water may be injected in the bladder for the purpose of distending and marking its outline in place of using the sound in it.

If the opening is very small a long flexible probe should be inserted and held by an assistant, then the constricting ring of scar tissue is cut by a number of small nicks or shallow incisions, taking care not to extend them in the direction of the bladder or rectum. After the opening is large enough for digital exploration the finger is used to

FIG. 140



Blunt dissection of the adherent vaginal walls should be made in the direction of the lines *X Y* and *X Z*.

separate the parts and to act as a guide in cutting unyielding bands until it passes beyond the stricture, then by hooking it behind the mass of scar tissue and drawing downward the parts can be palpated between the thumb and finger and the scissors more freely used.

When a point of cleavage is found in the newly cut surface, blunt dissection is made laterally and posteriorly, curving around the sides of the rectum (Fig. 140), which is easily recognized by the hard roll of cotton within it. The fingers are thus turned away from the bladder and directed in the folds formed by adhesions of the lateral and poste-

rior walls of the vagina. If the adhesions are very dense they may be cut through with a few clips of the scissors, one prong of which is guided by the finger in the contracted vaginal canal; the other is turned outward to the side of the vagina; short snips are made until all resisting bands are severed and the vagina is capable of extensive dilatation. Inspection will then show the lateral walls bare of epithelium while the anterior and posterior walls are each covered with a small dumb-bell-shape patch of mucous membrane. The narrowest point corresponds to the site of greatest contraction. All cicatricial tissue should be carefully excised, and if the contraction is narrow in the direction of the long axis of the vagina, that is, if it runs crossways, it may be entirely removed. The dumb-bell patches of mucous membrane are thereby cut in two parts at the narrowest point, leaving four surfaces, two each on the anterior and posterior walls. The edges of these patches may be dissected up by cutting transversely, and when sufficiently loosened stitch together with catgut, and if they cannot be approximated without tension silkworm-gut should be used. The anterior and posterior walls are then fairly well covered with mucous membrane, but the lateral walls are raw, ragged, and bleeding. To cover these, flaps may be taken from the labia or the skin of the perineum and inner side of the thighs.

Crede, in 1883, was the first to do this, utilizing the "skin over one of the labia majora."[1]

Mackenrodt transplanted flaps of mucous membranes taken from other cases, such as prolapse of the vagina. The grafts were held in place by tampons (iodoform), which were left in ten days, or a number of flaps were sewed together around a cylindrical speculum and then introduced into the vagina.[2]

Robert Abbe followed a similar plan except he covered a cylindrical plug of gauze made to fit the vagina with a thin rubber bag, and perforated the latter with a number of small holes for drainage. He cut the grafts from the skin surface in long, wide sections and stitched them to the plug with the raw side out; the vagina was then held open with deep retractors to prevent displacement of grafts on introducing the plug.

A rubber tube covered with iodoform gauze was placed in the rectum for the escape of flatus. Bowels were constipated for a few days. On the tenth day he removed the gauze from the inside of the rubber bag, the latter then coming away without disturbing the grafts.[3]

Noble's Flap Operation.[4]—The incisions outlining the flaps start about the centre of the lateral margin of the vaginal orifice at the base of the hymen or carunculæ myrtiformes and extend upward

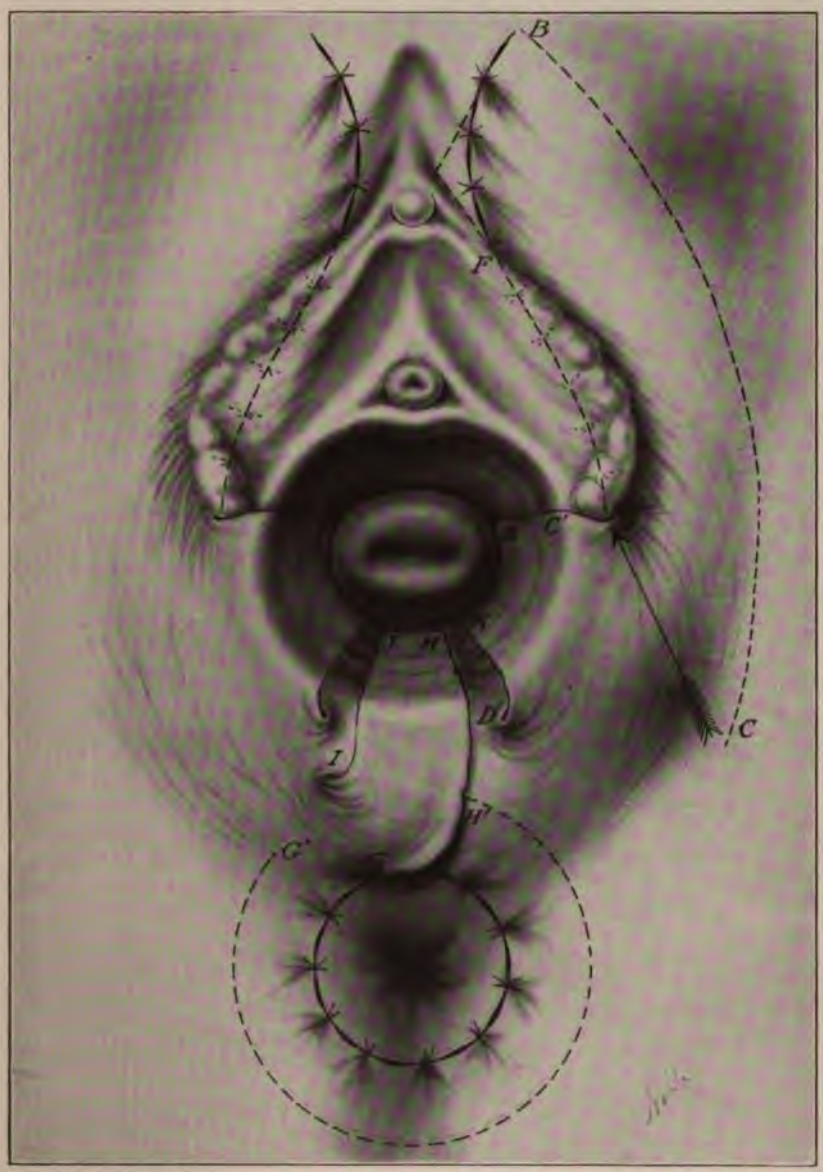
[1] Burrage, American Journal of the Medical Sciences and New York Medical Journal, October 9, 1897.

[2] New York Medical Journal, November, 1896.

[3] Medical Record, December, 1898.

[4] Transactions of the Southern Surgical and Gynecological Association, 1900.

PLATE XVI.



D', D, F, B and C. Outlines for flaps to be placed in long axis of the vagina

A, B, C, D and D' Flaps sutured in place.

D', F and B. Line of sutures closing wound. The end of the incision at C is moved to C' and D, as shown by the arrow.

Flaps G, H, I and J cut from prolapsed mucous membrane of anus.

along the inner margin of the labia majora just external to the nymphæ to the clitoris, then upward and outward at a right angle to the mucocutaneous margin on the outer border of the labia. This should be followed downward to the perineum, taking care to leave a wide base to each flap. (See Plate XVI.)

The flaps should be dissected deeply in order to preserve the perineal branches of the pubic artery. The angles at the distal extremity of the two flaps are stitched together with catgut, the mucous surfaces opposite each other. The flaps are then turned into the vagina and pressed against the lateral vaginal walls by packing strips of iodo-

FIG. 141

Side view of flap *A' B' C'* and *D'*.

form gauze between them, which should not be removed for two or three days. The wounds over the labia from which the flaps were taken are closed by stitching the edges together with silkworm-gut. In two weeks the pedicles may be cut from the flaps and returned to their normal places and secured with sutures.

Inspection of the vagina will then show long narrow strips of granulating tissue between the flaps and the patches of vaginal mucosa. If these strips show a tendency to form constricting bands later on, the vagina should be kept dilated with the rubber bag tampon as above described.

Operation for Complete Atresia.—In complete atresia of the vagina the chief dangers are accidents in the dissection. With hæmatocolpos a fluctuating point may be found about the centre or side of the scar. This should be punctured and a soft-rubber bougie inserted, and then the dissection may be continued as described in the operation for incomplete atresia.

When the cicatricial mass is so extensive that fluctuation cannot be felt through it, or the vaginal cavity above the obstruction safely reached by puncturing as above described, the finger may be carried laterally in the cellular tissue on the outside of the vagina and inserted deep enough to reach the contained menstrual fluids, which may be detected by the sense of fluctuation; the retention sac or upper portion of the vagina should then be punctured and the finger inserted into it.

The finger now being above the obstruction serves as a guide in dissection. The retained menstrual fluids having been discharged, the bladder is filled with air or water, to avoid the necessity of frequent sounding.

Now, having the rectum well marked by a roll of cotton, the bladder distended with water and a finger above the cicatricial mass in the vagina, the latter is quickly and safely opened with rapid cuts of the scissors.

The operation is then completed by grafting or transplantation of flaps, as above described.

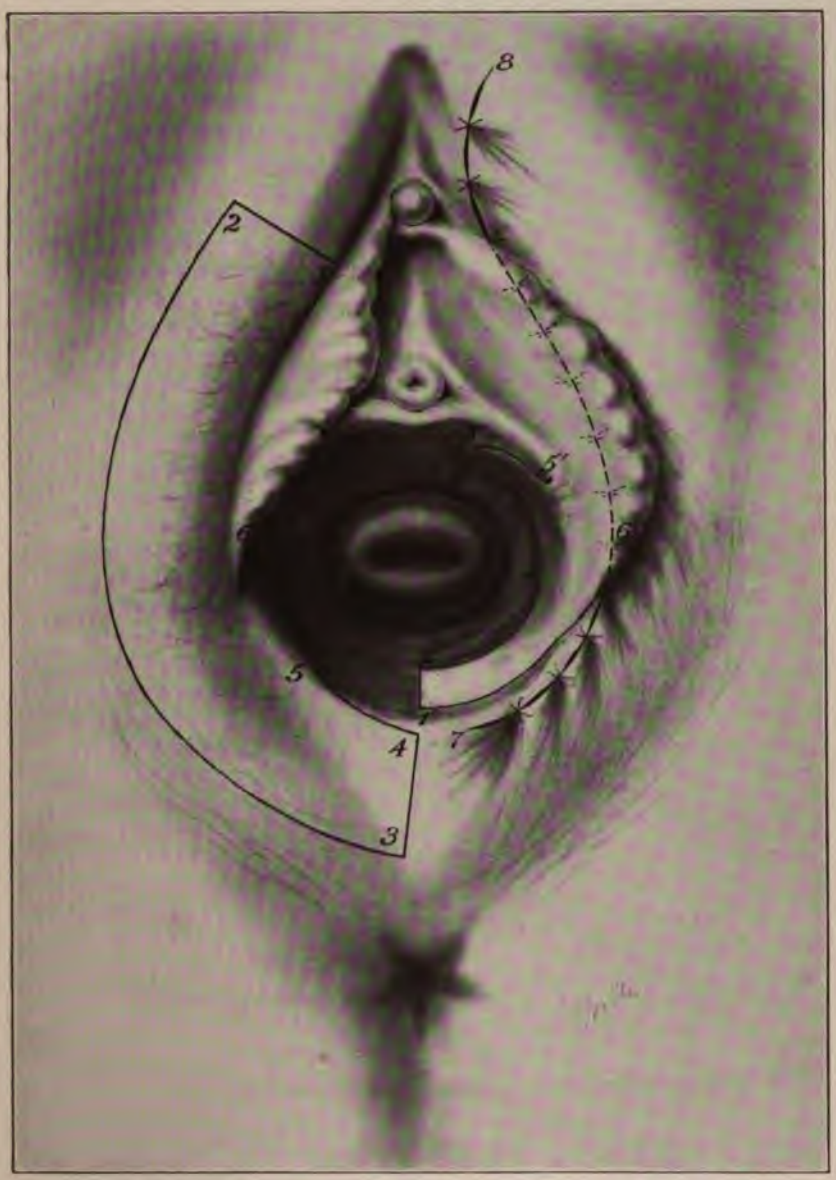
But no attempt should be made at flap operations or grafting until after recovery from evacuation of menstrual accumulation, for the danger of infection is liable to interfere with the success of such procedures.

If in congenital cases it is desirable to make a small vagina for drainage purposes only, narrow flaps of mucous membrane or skin from the perineum may be used; but if the uterus is large or the case traumatic in origin, a capacious vagina is desirable, especially in married women. Such circumstances require wide flaps, necessitating turning in all the mucous membrane of the labia, and when practicable, prolapsed mucosa of the rectum. Or very wide skin flaps may be cut from the thighs, which, by means of long pedicles, may be transferred to the vagina.

In one of the first cases in which the writer utilized the covering of the labia the line of demarcation between the skin and the mucous membrane was very faintly shown, the woman being a negro who came to the Grady Hospital from South Georgia. Quite a strip of skin was attached to the outer margin of each flap and a number of hair follicles were transplanted into the vagina. But the subsequent hairy growth was limited and gave no inconvenience.

A young woman having congenital absence of the vagina was seen in 1901. There was a rudimentary uterus and menstrual molimina, but no accumulation of menses. The external genitals were normal and a slight depression represented the introitus.

PLATE XVII.



1, 2, 3, 4, 5 and 6. Mark the line of incision for flaps that are to be placed perpendicular to the long axis of the vagina.
1', 2', 3', 4' and 5'. Flaps stitched in place.
6', 7 and 8. Wound on labium closed.

A curved incision extending from the labium minus on one side down around the posterior commissure to the corresponding point on the opposite side was made. The rear half of the newly formed vaginal orifice was in this way outlined.

The mucous membrane within the U of this incised line was closely adherent to the bladder and was left intact as a lining for the lower part of the anterior vaginal wall. The bladder was separated from the rectum as far as the peritoneum, which was not over two and a half inches from the perineum. In order to gain sufficient depth, dissection was continued upward on the right side of the rectum and behind the peritoneum. The perineum was then cut through down by the side of the rectum to the tip of the coccyx and the cavity enlarged sufficiently to admit my hand. Extensive dissection was necessary,

FIG. 142

Showing four and one-half inches of speculum in the artificial vagina six months after operation.

as very wide flaps were required to make a roomy vagina, and as the pedicles were as wide as the flaps the vaginal orifice had to be cut backward in order to accommodate them. A flap three and a half inches wide and ten inches long was cut from the inner aspect of each thigh, making them as thick as the ordinary skin flaps in amputation of the leg. The pedicles were made as close to the vaginal orifice as possible, yet half the length of the flap was taken up in the twist of the pedicle. The ends of the flaps were stitched together by two catgut sutures, one at each corner. The skin surfaces were then facing each other, and in this position they were carried five inches in the newly dissected vagina and held in place by packing wet salt gauze between them. A catheter was placed in the centre of the gauze packing, its end brought out through the wet salt dressing, placed on pedicles, and arranged so

it could be easily uncovered for the purpose of injecting salt solution in the vagina as occasion required.

At the end of two weeks the pedicles were cut and sutured in normal places. The perineum was then closed with silkworm gut. Six months afterward the vagina was fully two inches in diameter and four and a half inches deep (Fig. 142).

J. F. Baldwin published in a recent journal an account of an operation for artificial vagina, in which he resected the intestine and brought the isolated loop down between the bladder and rectum for a new vagina. The writer did a similar operation, utilizing the rectum for a vagina and stitching the sigmoid flexure to the anus to take the place of the rectum. The sigmoid flexure of the colon came down in front of the upper end of the rectum, turned to its right side, and ended behind its lower extremity, the latter having been drawn forward and stitched to the vaginal orifice, thus the new vagina and rectum were somewhat crowded, crossing each other in their long axes.

The results were satisfactory, but it was an operation of such magnitude the writer has not felt justified in recommending it, especially where operation is done solely in the interest of marital relations; the risk deserves serious consideration.

Dangers.—The dangers of operations in the vagina lie in that of penetrating the bladder, rectum, or peritoneal cavity at Douglas' pouch and in laceration of the ureters, hemorrhages, and septic infection, especially in accumulation of menstrual discharges.

ENURESIS.

Enuresis does not belong to gynecology, but there are some surgical features in isolated cases. It is intended here to consider briefly only the cases that fail to respond to medical treatment. These must have local causes medicines cannot remove. I refer to inflammatory thickening of tissues in the region of the meatus or introitus vaginæ, hyperæmia of erectile tissue, hyperæsthesia of the meatus, and other conditions capable of exciting reflex neurosis by irritation of the meatus urinarius.

These conditions result from inflammatory diseases or a lack of cleanliness in childhood, which when neglected may follow the patient into adult life and become a source of mortification. The disease sometimes assumes the habit of nocturnal incontinence, but also occurs in the daytime. Frequent voiding of urine irritates the inflamed parts and tends to increase or continue indefinitely the duration of the affection. The hymen, nymphæ, and mucous membrane become more and more thickened, hypertrophied, or sensitive and very susceptible to strut and tension peculiar to erectile tissue. This encourages hyperæmia of the meatus and urethra, resulting in reflex nervous impressions above referred to and consequently involuntary loss of urine.

Surgical Treatment.—F. T. B. Fest,[1] of Michigan, and Gilliam,[2] of Ohio, resorted to about the same measures at the same time. They made a vertical incision on either side of the meatus about half an inch deep, then brought them together by suturing in the opposite direction, approximating the two ends of each incision and spreading the sides apart; the sutures, therefore, were placed in line at a right angle to the incision. They thought forcing tissue against the sides of the urethra near the meatus would form a mechanical barrier to the escape of urine and also lessen the hyperæmia of the urethral mucous membrane.

Gilliam also believed that it cut off a certain amount of nerve supply to the meatus and interrupted reflex neurosis, thus becoming not the least important feature in the operation.

Gilliam's first case had an anomalous band connecting the urethra with the side of the vaginal orifice. This band was in all probability a part of a defectively developed hymen, and when it was removed a certain amount of tension upon and irritation of the meatus was relieved.

The result was like that of its analogue, circumcision of the male, is expected to be.

My first case[3] was a seventeen-year-old overgrown girl of phlegmatic temperament. She continued the habit of wetting the bed all her life, but in the daytime had sufficient control over the bladder to enable her to reach a proper place for urination. The urine was normal in every respect; neither were there rectal irritation nor constipation to which reflex action could be ascribed. As medical treatment had utterly failed, a cystoscopic examination was made (in 1898) without finding even as much as a simple hyperæmia of the mucous membrane of the urethra or trigonum.

An injection of sterile milk was used in search for a congenital fistula, but with negative result.

A close inspection failed to disclose a supernumerary or abnormally placed ureter. In fact, no malformations were discovered. By exclusion exciting causes were narrowed down to effects of inflammatory process.

I then detected an inflamed and thickened hymen, annular in shape and infiltrated until it was three-eighths of an inch thick at its base, and very intimately connected with the meatus. It occurred to me that it was the source of the trouble.

It was her habit to sleep on her face, which doubtless contributed to an accumulation of bodily heat about the external genitalia, resulting in stimulation of the sensitive and irritable hymen, which, becoming more or less erectile, irritated the meatus; this in turn stimulated the circular muscles at the neck of the bladder and trigonum, resulting in involuntary micturition.

Acting upon this idea, I cut through the hymen on either side of the

[1] American Journal of Obstetrics, April, 1896, p. 561.
[2] Ibid., February, 1896.
[3] Ibid., February, 1901.

urethra and dissected the latter free from its attachments back to the suspensory ligament (Fig. 143). At this stage of the operation the urethra

FIG. 143

Cut through the hymen on either side of the urethra, dissecting latter free from its attachments back to the suspensory ligament.

was hanging from the pubic arch like a pendant with a portion of the hymen attached to the under surface close to the meatus (Fig. 144).

The next step in the operation consisted in passing two sutures through the attached portion of the hymen, on either side, and fasten-

FIG. 144

The urethra was hanging from the pubic arch like a pendant.

ing them to the pubic arch, making a sling or support to the urethra (Fig. 145).

This being in the nature of an experiment, I made use of a little moral treatment. It consisted in having her awakened the first night every two hours to void urine; the second night every three hours; the third

night, every four hours, and so on until she passed the entire night without evacuating the bladder.

The progress of the case was exceedingly gratifying, no accidental passage of urine or unpleasantness whatever having occurred since.

FIG. 145

Two sutures passed through attached portion of the hymen on either side fastened the urethra to the pubic arch.

The second case, an unmarried woman aged twenty-three years, had enormously hypertrophied nymphæ with extension of hyperplastic tissue to the meatus. She suffered most inconvenience from incon-

tinence in the daytime, from fatigue, exercise, excitement, etc., especially during the menstrual period.

Recovery followed removal of hypertrophied tissue, regulation of habits, and attention to general health.

The number of cases reported (Fest 1, Hoover 1, Gilliam 2, and myself 2) are limited, but being successful they demonstrate that a small class of intractable cases may be relieved by surgical means when the exciting causes can be detected. But it is understood here that most cases of enuresis get well with medical treatment.

DISEASES OF THE VULVA.

Vulvitis.—The term vulvitis is used commonly to indicate inflammation of the labia majora, labia minora, vestibule, and meatus urinarius. The process may involve the clitoris and hymen; it frequently extends to the vagina, urethra, vulvovaginal glands, and adjacent skin. Rarely is the inflammation limited to any one of the parts mentioned; if so, or if the changes are much more marked in one locality than another, the symptoms vary in some degree according to the seat of the disease.

If venereal vulvitis and the vulvitis common among children be excepted the disease as a primary affection is rare. It is usually the extension of a vaginitis or a complication of some pre-existing disease.

Varieties.—The disease may be considered under the heads of simple, venereal, and follicular. Any eruptive disease may extend to the vulva. Sometimes in septic postpartum women the vulva or vagina or both may be covered with a whitish exudate. This has been called diphtheritic vulvitis. Such an exudate is said also to be formed occasionally during the course of typhoid fever, scarlet fever, and some other grave constitutional diseases.

Etiology.—Lack of cleanliness is the most common cause of simple vulvitis. The vulva is abundantly supplied with sebaceous and sweat glands. The smegma produced by the sebaceous glands, unless frequently removed by bathing, easily decomposes under the influence of sweat. The local condition is thus often so unhygienic as to become irritating. The discharge from a cancerous cervix, or from a vesicovaginal or rectovaginal fistula, may very often so irritate the external genitals as to establish inflammatory lesions. The same may be said of the leucorrhœal discharge in some forms of endometritis. Vulvitis with pruritus is frequently caused by diabetic urine decomposing on the vulva. Excessive indulgence in coition, masturbation, contact of the surfaces in fat women, friction from ill-fitting clothing, thread-worms, and other like irritants are causative factors. The scrofulous diathesis predisposes to the disease. It is more prevalent in hot than in cold weather, and among children than among adults.

Venereal vulvitis is caused by gonorrhœa, syphilis, and chancroid. Gonorrhœa is by far the most frequent source of vulvitis in adults.

The follicular variety has practically the same etiology as the simple type. It is much less common.

Herpes, eczema, and erysipelas are the most important of the eruptive diseases involving the vulva. Herpetic eruptions may be syphilitic or gonorrhœal in origin.

Symptoms.—In simple vulvitis the symptoms are those which characterize inflammation of mucous membrane elsewhere. The labia, vestibule, and clitoris are red and swollen; they are at first dry, but later a mucopurulent, offensive discharge becomes abundant. There is a feeling of local burning and heaviness, tenderness is marked, and contact of urine during micturition causes smarting. The process may go on to excoriation and ulceration. The discharge may irritate the skin of the inner thighs and perineum. Usually pruritus is a most aggravating symptom, and the desire to scratch is well-nigh uncontrollable. Inguinal adenitis may ensue.

When gonorrhœa is the cause of vulvitis the symptoms are much more severe. Examination with the finger produces the most excruciating pain. The purulent discharge is heavy. The vagina is involved; the meatus is red and swollen; often the ducts of Bartholin's glands and the glands themselves become involved; urethritis and cystitis are common complications; while the well-known tendency of the disease to invade the internal organs of generation makes it dangerous in the extreme. Constitutional symptoms may be marked. The gonococcus can be usually found. Vulvitis from syphilis takes the form of a chancre on one of the labia or the vestibule. Secondary lesions in the form of mucous patches may also be formed here. Vulvitis from chancroids presents the usual signs of such lesions. The inguinal lymphatics often suppurate when the cause is gonorrhœa or chancroid; their enlargement is a common occurrence when the affection is syphilitic in origin.

In follicular vulvitis there is an infection of the hair follicles and sebaceous glands about the labia and vestibule. A kind of acne is thus produced.

Treatment.—The first principle to be observed in the treatment of vulvitis is absolute cleanliness. Rest is the next most important point to be observed. Saline cathartics are indicated. It was noticed that simple catarrhal vulvitis is most often dependent upon some pre-existing pathological state, such as leucorrhœa, diabetes, etc. Attention should of course be directed to the removal, if possible, of the causative condition.

Frequent bathing and separation of the affected parts usually serves to bring about a cure of the simple type when the cause is lack of personal cleanliness. When a discharge, as from a cancerous cervix or a rectovaginal fistula, is the cause, the vulva must be protected from such discharge if it cannot be arrested. In short, any of the circumstances mentioned as being causative factors in the disease must be corrected if possible. The parts should be bathed frequently with some antiseptic solution, such as boracic acid, 1:50; bichloride of mer-

cury, 1:2000, or Goulard's extract diluted with three or four parts of water. The labia should be separated by absorbent cotton placed between them, and a pad of gauze moistened with one of the solutions just mentioned and covered with cotton, or better with rubber tissue, should protect the vulva continuously; or after each cleansing the vulva may be dried and dusted with zinc oxide, bismuth subgallate, or some other desirable powder. If there is no vaginal discharge it may be possible to apply zinc oxide ointment with satisfaction. If there be a vaginal discharge from any cause the vagina should be tamponned; the tampons should be changed as often as the amount of discharge requires, and a douche given after each removal. Powdered alum and sugar, equal parts, are said to afford relief in diabetic vulvitis.

The primary object in the treatment of gonorrhœal vulvitis is removal of the gonococcus, but the inflammation excited by this organism is so severe that alleviation of the symptoms is more urgently demanded than in other cases. The observations just made respecting cleanliness and rest are applicable here. More frequent cleansing of the parts and change of dressings will be necessary. In addition to the measures mentioned it will be found well to paint the inflamed surface every second day with a solution of silver nitrate 10 grains to the ounce, sulphate zinc 1 grain to the ounce, or with compound tincture of iodine in two parts of water. When the process begins to subside some antiseptic powder should be used. If chancroid be the cause cauterization and isolation of the sore usually effect a cure. Drying powders, like iodoform, tannin, aristol, etc., should also be employed. Syphilitic lesions here demand constitutional rather than local treatment as a rule.

Alkaline solutions are of value in the follicular type. Ointments of zinc oxide and ichthyol are used with success. It should be remembered, however, that cleanliness is the thing most to be desired. It may become necessary to open and cauterize the follicles separately. Removal of the affected skin has been practised.

The treatment of herpetic and eczematous eruptions of the vulva is the same in principle as the treatment of these affections elsewhere on the body.

Pruritus Vulvæ.—Pruritus is to be regarded rather as a symptom than as a disease *per se*. The distress occasioned by it, however, often so predominates over the causative condition that separate consideration of the subject is warranted.

Pruritus vulvæ is a term used to signify intense itching of the pudendum. Scratching soon brings about cutaneous abrasions, and later ulceration. On the ulcerated surface an exudate is formed, which exudate, when carried to adjacent parts of the skin in the process of scratching or otherwise, seems to set up an irritation similar to the original. The disease thus comes to involve the perineum, anus, inner thighs, and perhaps the abdomen; the itching may even extend into the vagina.

Etiology.—The most common causes of pruritus are acrid discharges, parasites, and diabetic urine. The irritating discharges may be from a cancerous cervix, an endometritis, or a vaginitis, gonorrhœal or otherwise. Parasites often giving rise to pruritus are pediculi and the oxyuris vermicularis. Diabetic urine decomposing under the influence of yeast fungi is very irritating to the skin. Pruritus accompanies vulvitis from any cause. It is often associated with congestion of the uterus, tubes, or ovaries, with pregnancy, menstruation, the menopause, and the strumous diathesis. It may result from masturbation and trichiasis; it may be an extension of pruritus ani; it may be the local part of a general eruptive disease of the skin, as eczema and scabies. Furthermore, there is an idiopathic pruritus, so-called because as yet no pathological change in the affected skin and no antecedent disease has been discovered as being a causative agent. It is evidently a neurosis. It is the most intractable type of the malady.[1]

Symptoms.—The itching, at first relieved by scratching, soon becomes well-nigh constant and unbearable. The patient eschews society in order to scratch. The itching is commonly worse at night and after exertion. The pudendum is soon excoriated from scratching. The exudate on the raw surface may reach adjacent parts and extend the pruritus. The raw surfaces are inviting fields for infection, and the patient may develop a vulvitis if this were not already such a preexisting condition. She is probably unable to sleep without hypnotics, and the general health is impaired. She becomes despondent and extremely nervous; insanity may ensue; the sexual appetite is increased and masturbation encouraged.

Diagnosis.—Reference to the paragraph on etiology emphasizes the fact that pruritus is almost always a result of some existing pathological condition. The diagnosis will here be taken to mean the discovery of the cause. It will be usually found quite necessary to resort to means for the palliation or relief of the itching, but to treat pruritus simply as pruritus is the utmost folly. The physician should exhaust every means at his command to determine if possible the trouble upon which the pruritus is sequent. It is greatly to be regretted if he be compelled to classify it as idiopathic. Whether or not a uterine leucorrhœa be the cause can be determined by keeping the discharge from coming in contact with the affected parts. Pledgets of cotton inserted against the cervix and frequently changed will do this. The same procedure carefully followed and properly modified will protect from acrid vaginal discharges and permit a diagnosis, if it be not already evident. Pediculi are to be sought for on the pubis and the oxyuris in the stools, especially of children. The urine should be always examined. Pelvic inflammation must be excluded.

Treatment.—This consists essentially in removal of the cause. Meantime the pruritus itself demands treatment. Cleanliness is a prime requisite. Irritating discharges from uterus or vagina call for pro-

[1] Seeligman believes every case of pruritus vulvæ is excited by a microscopic parasite.

tecting tampons, frequently changed, and douches, together with appropriate treatment of the disease upon which the discharge is dependent. For pediculosis a strong solution of bichloride of mercury (1:500) applied twice daily for a few days to the shaven parts is usually satisfactory; blue ointment may be employed. Pin-worms are usually disposed of by rectal injections of quassia. When diabetic urine is the cause the patient should be directed to prevent, so far as possible, soiling of the vulva when she urinates, and to dry and dust the parts with some drying powder.

In all cases diet and the general health should receive attention. Alcohol and richly seasoned foods are to be interdicted. Tonics are of value. Sleep must be secured with bromide, trional, sulfonal, or other hypnotic.

For the itching itself a very large number of remedies are advocated, no one of which is satisfactory in a majority of cases. Among them may be mentioned the following: Subnitrate of bismuth and prepared chalk, equal parts, dusted on the affected area. Morphine and prepared chalk (1:2) used in the same way. Bichloride of mercury, 1:500, in emulsion of bitter almonds. Solution of iodoform in ether sprayed over the parts with an atomizer. Saturated solution of bromide of potash painted over the surface several times daily. Applications of lead-water and laudanum, also of peppermint-water.

℞—Tinct. opii,
Tinct. iodi,
Tinct. aconit. . . . . ää 5 gtts.
Acid. carbolic. . . . . 1 dr.
Apply twice daily.

Strong solution of carbolic acid or silver nitrate.

Ointment containing chloroform, chloral, acetate of lead, etc.

It is said that tobacco smoking has occasionally given relief.

L. Seibaurg recommends local injection of salt solution. The pressure produces anæsthesia.

Finally, removal of the affected area of skin and mucous membrane is warranted when other measures have persistently failed (Fig. 146). This operation, however, does not always effect a cure.

Inflammation of the Vulvovaginal Glands.—The vulvovaginal glands (Bartholin's glands) are analogous to Cowper's glands in the male. They are situated, one on each side, on the deep inner aspect of the labia majora at the junction of the posterior and middle thirds. The ducts are nearly an inch long and open just external to the hymen, about the middle of the ostium vaginæ. The glands are the size of a large bean and can be felt in thin subjects. They belong to the compound racemose type. Their secretion is abundant during sexual excitement. Inflammation may involve only the ducts, in which case little harm is done unless the lumen becomes occluded and a cyst results; or it may involve the gland proper, when an abscess usually is formed.

Etiology.—The most common cause of Bartholinitis is gonorrhœal infection. Staphylococci and streptococci from an ordinary vulvitis

may invade the ducts; particularly violent cases may be caused by mixed infection.

Symptoms.—When the duct only is involved the disturbance is trivial except in so far as the inflammation may lead to the formation of a cyst—a condition presently to be noted. There is a little redness and swelling about the mouth of the duct and a little discharge. Pressure

FIG. 146

Vulva one year after removal of all skin and mucous membrane from the labia majora.

over the course of the duct expresses a drop of pus. There is some tenderness.

When, however, the gland has become infected the symptoms are more distressing. An abscess is usually formed, though the inflammation may occasionally gradually subside. There is heaviness and tenderness in that part of the pudendum. There may be fever. The labium is red and swollen, the shape and location of the tumor being quite characteristic (Fig. 147). It protrudes beyond the vulvar cleft and pushes the opposite labium to one side; it may reach the size

of an egg; its largest end is directed backward toward the anus. When an abscess has been formed fluctuation can be detected on the inner surface of the labium majus. Edema extends for some distance around the tumor proper, and unless proper treatment be instituted the abscess will rupture in one or more places and fistulous tracts may be formed. They will discharge indefinitely a purulent or mucopurulent material, which is dangerous if the original infection was with the gonococcus. The portions of the gland which have not been destroyed by ulceration will remain in a state of hypertrophic induration.

FIG. 147

Abscess of vulvovaginal gland.

When the gonorrhœal poison once gains entrance to these glands it is most difficult of dislodgement. It may remain here in a semidormant state for a very long time as a source of unsuspected infection for men.

Diagnosis.—There are a few things with which an abscess of Bartholin's gland may be confused. An ordinary furuncle in this particular locality is rare; it is accompanied with a greater amount of induration around its base; it has not the characteristic shape; the duct is open. A rectal or ischiorectal abscess presents points which distinctly direct the attention to the rectum.

Treatment.—Inflammation of the duct should be treated by injecting a weak solution of some such astringent as silver nitrate or zinc sul-

phate after the pus has been squeezed out. It will usually be found best to open the duct with a small knife when it may be irrigated and the solid stick of silver nitrate used. An abscess calls for evacuation. The incision is made in the long axis of the labium at the junction of the skin and mucous membrane. When the cavity has been thoroughly irrigated with a strong bichloride solution it should be swabbed out with pure carbolic acid and packed with iodoform gauze, the packing to be changed daily until granulations have obliterated the space. If the patient has been anæsthetized the sac may be cut out with scissors or scraped away with a curette. If the abscess has been allowed to evacuate itself complete removal with scissors or curette of the remaining indurated parts of the gland is demanded. The cavity thus made may be closed with buried catgut sutures; it is safer probably to pack it.

Cysts of the Vulvovaginal Glands.—These cysts may be of the ducts or of the gland itself. If only the duct is involved the cyst will not be larger than a chestnut; if the gland is cystic the tumor may attain the size of a small cocoanut. In the latter case the cyst may be unilocular or multilocular. The contents are fluid or semifluid in character, viscid and clear or yellowish in color; from hemorrhage into the sac they may have a chocolate color.

Etiology.—These cysts almost always result from antecedent inflammation of the duct. The walls thus become glued together and the secretion cannot escape. Occasionally, though the duct may be patent, the secretion is so viscid that it cannot escape except under the influence of unusual pressure.

Physical Signs.—There is an ovoid tumor raising both labia on the affected side. Its long diameter is in the long axis of the labium, on whose mucous surface it is most prominent; being situated deeply, it raises both the small and large labia. It fluctuates, or if not, it is elastic and compressible. The duct is usually closed. There is no tenderness unless the cyst has become inflamed. If so the symptoms of abscess already noted are present.

Diagnosis.—These cysts are to be distinguished from pudendal hernia, hydrocele in the canal of Nuck, sacculated cysts of old hernial sacs and cysts of the round ligament. A hernia, if of the intestine, will commonly give resonance on percussion and succussion on coughing; if of the omentum or ovary its connection with the abdomen can be usually determined; in any case reduction may be accomplished. A hydrocele is more inclined to be translucent, is more fluctuating and diffuse, and is comparatively rare. In case of the other cysts mentioned the swelling may be traced to the inguinal ring and is situated in the upper and outer portion of the labium majus rather superficially.

Treatment.—If the cyst be simply opened and the contents allowed to escape the condition will recur. The sac must be destroyed. The easiest way to do this is to open the cyst well, evacuate and cleanse thoroughly, cauterize with pure carbolic, then pack with gauze until the cavity has filled with granulations. A more scientific and satis-

factory procedure is to completely dissect out the cyst sac with knife or scissors and close with buried catgut sutures. If the cyst become inflamed the treatment is the same as already described for abscess of the vulvovaginal glands.

TUMORS OF THE VULVA.

Inflammatory swellings are tumors as well as the enlargements which we are about to discuss. But the term tumor is usually applied to circumscribed new-growths which are primarily at least non-inflammatory, and which run a chronic course, whether benign or malignant. The term is so used here.

Tumors of the vulva are gaseous, liquid and solid.

The gaseous tumors are herniæ.

The liquid tumors are cysts of the vulvovaginal glands, hydrocele, sebaceous cysts, and blood cysts.

The solid tumors are hæmatoma, urethral caruncle, varicose veins, elephantiasis, œdema, neuroma, papilloma, condyloma, fibroma, lipoma, enchondroma, epithelioma, and sarcoma.

Pudendal Hernia.—The more common form of pudendal hernia is the anterior labial; a rare form is posterior labial.

The anterior labial descends through the inguinal canal by the side of the round ligament into the labium majus. It corresponds to inguinal hernia in the male with descent into the scrotum. The typical hernia under consideration contains intestine, but the sac may hold instead omentum, ovary, tube, or uterus. The last-named displacement is exceedingly rare, though a pregnant uterus has been reported as being found thus descended as well as ovarian cysts and tubal gestation masses.

Posterior labial or vaginolabial herniæ push through the pelvic fascia and levator muscle and present at the posterior part of the labia majora. They may protrude through the vulvar orifice.

Diagnosis, Symptoms, and Treatment.—The diagnosis, symptoms, and treatment are practically the same as for hernia in the male.

Cysts of Vulvovaginal Glands.—These have already received attention.

Hydrocele.—Hydrocele in the female is analogous to hydrocele in the male. The round ligament in the female is the analogue of the spermatic cord in the male. These ligaments terminate in the larger labia. Surrounding them in their course, after they enter the inguinal canal in the fetus, is a protrusion of peritoneum which may persist in the adult and which is known as the canal of Nuck. The gravitation of serum through the patulous canal of Nuck into the labium majus, or increased serous secretion in the distal portion of the canal which has been proximally occluded, constitutes pudendal hydrocele. It is an exceedingly rare affection.

The tumor fluctuates distinctly; the sac is quite thin so that the mass

is translucent. It can be reduced into the abdomen by pressure, but returns.

The swelling is most liable to be mistaken for a hernia. The history, the translucency, the absence of the usual characteristic signs of hernia, such as succussion on coughing, etc., serve as points of differentiation. If the canal of Nuck be patulous pressure on the tumor will partially or completely obliterate it. There is no thickening along the inguinal canal. An aspirating needle will clear up all doubt, but its use is seldom necessary.

Treatment.—The object sought after in treatment of hydrocele is obliteration of the sac. The contents reaccumulate after simple aspiration. The injection of tincture of iodine, carbolic acid, or some other irritating agent subsequent to aspiration may engender obliterative inflammation and so destroy the sac. Care should be exercised, however, not to force such fluids into the peritoneal cavity through a patulous canal. If the condition resists such measures the sac may be opened freely and packed with gauze.

Sebaceous Cysts.—Sebaceous cysts occur wherever there are sebaceous glands. These glands are abundant about the labium majus and cysts here are not uncommon. They do not reach a size to confuse them with cysts of Bartholin's glands. Their treatment is the same as for like cysts elsewhere.

Blood cysts may be found in the pudendum.

Pudendal Hæmatoma.—Pudendal hæmatoma, or hæmatocele, is a tumor of the vulva, or some part of it, due to a subcutaneous collection of blood. The usual cause is rupture of a vessel or vessels by violence.

The most common form of violence is the passage of the fetal head during labor. Falls, blows, kicks, and other such injuries to the vulva are frequent causes. A varicose vein may rupture, especially during labor, allowing hemorrhage in large amount.

The swelling usually appears rather suddenly and may be as large as an orange or larger. It has a characteristic purplish color. The parts may be so tense as to give rise to considerable pain. There is heaviness and tenderness.

The condition is not usually confounded with other tumors of the vulva. Œdema of the labia, cysts and abscesses of Bartholin's glands are to be remembered. Œdema is almost always bilateral and associated with œdema elsewhere. A cause can generally be discovered for it. Cysts develop much more slowly and fluctuate; the same may be said of abscesses, and they, too, are painful. The characteristic color of the hæmatoma, together with the history, is usually sufficient for differential diagnosis.

Hemorrhage in these cases is seldom severe, since it is stopped by tension of the tissues. When the skin has not been broken the mass may be absorbed gradually. In fact it is usually best in such cases to apply a light compress and leave the treatment to nature. If the swelling be so large as to lead to the belief that sloughing will occur, or if the skin has been broken, the danger of infection is so great that incision

is warranted. The clots should be evacuated, the cavity thoroughly washed out and bleeding points looked for and ligated. If ligation be found impossible the hemorrhage can be stopped by packing the cavity with gauze.

Urethral Caruncle.—This is the most common of the new growths about the urethra. There are two varieties. The first is a capillary aneurysmal varix covered with mucous membrane, making a tuft the size of a pea or considerably larger; the second consists of a prolapse of a varicose urethral mucous membrane and resembling hemorrhoids. The first variety is the more common. It is situated usually just within the meatus posteriorly and protrudes when the labia are separated. It may occur at any age, but it is most frequent in middle life. The neoplasm is often erectile, increasing in size at menstrual periods. A varicose urethra with protrusion may be caused by a sluggish, venous circulation from any cause, accompanied by vesical tenesmus.

Symptoms.—It is seldom that unpleasant symptoms are absent. The finger in the vagina pressing upward against the urethra brings into view a red, strawberry-like growth which bleeds easily when touched. It may be pedunculate or attached by a broad base. There is ardor urinæ, with painful micturition. Friction from clothing, etc., cause much distress, and dyspareunia is common. Hemorrhage from accidental bruising of the tumor is frequent. An extreme degree of nervousness may develop; loss of sleep may become serious.

The local symptoms from a protruding mucous membrane are not usually so marked.

Treatment.—The treatment is by removal. The tumor is so friable that it is easily torn to pieces, and it is well to grasp it with a T-shaped forceps, slip the scissors under and clip it off, care being exercised to remove the whole growth. It is well to stitch the adjacent mucous membrane over the denuded area. Recurrence will be less likely to take place if the base be cauterized with the Paquelin cautery. Since laceration of the caruncle gives rise to rather free capillary hemorrhage, and thus makes the operator sometimes doubtful if he has removed all the growth, the destruction of the whole tumor with the cautery may be thought preferable to its removal with knife or scissors. The operation is usually done under cocaine anæsthesia.

When the condition is one of protruding mucous membrane the urethra should be thoroughly cocainized and dilated. Then with the aid of a proper speculum four narrow linear areas along the four walls of the urethra are touched with a fine cautery point. The four resultant cicatrices will prevent subsequent protrusion.

Varicose Veins of the Vulva.—The veins of the vulva may become varicose just as in any other part of the body. The condition may be a part of a general varicosity of the dependent portions of the body, or it may result from any local obstruction to the return of circulation. It is not uncommon in pregnant women and in women who have abdominal tumors. Straining at stool may be a causative factor.

There may be no symptoms. The swelling may be the only thing which attracts the woman's attention; or there may be local heaviness and irritation. The diagnosis is easy. Other tumors are excluded without difficulty.

Treatment.—Not much can be done in the way of treatment. It should not be forgotten that rupture of the veins with grave hemorrhages may occur during parturition. Constipation is to be relieved. The dull pain may call for pressure which may be obtained by a pad suitably applied to the labia. Removal of the cause at least partially relieves the condition.

FIG. 148

Gonorrhœal condylomata removed from negro girl twelve years of age, at the Grady Hospital, Atlanta, Ga.

Condylomata Vulvæ.—Not infrequently there develop about the vulva simple vegetations which may appear as numerous wart-like growths scattered over the vaginal mucous membrane, the labia, small and large, and the skin surrounding the vagina and anus; or there may be a cauliflower growth attached by a broad base to one side of the vulva and exhibiting a decided tendency to extend to the adjacent surfaces (Fig. 148). It may thus grow up over the mons veneris or backward around the anus. These condylomata are usually, though not always, an evidence of gonorrhœa or syphilis. They are accompanied by a leucorrhœal discharge which, being partly retained in the numerous recesses of the growth, gives rise to a most offensive odor.

A bloody discharge from the surface is common; it adds to the foul odor and repulsive appearance. The broad distribution of these growths is largely due to the fact that transmission by contact is frequent.

Treatment.—Isolated warts usually disappear under the influence of cleanliness, antiseptic douches, and the administration of potassium iodide. If they do not yield early to medical treatment they should be excised and their bases touched with the actual cautery. The parts should afterward be kept clean and frequently dusted with drying powder. All the vegetations must be removed or recurrence is apt to take place.

When the growth is extensive excision should be practised at once under general anæsthesia. In these cases the denuded area should be covered with adjacent skin.

The leucorrhœa of pregnancy may be responsible for the condition, in which case the liability to postpartum septicæmia is so enhanced as to make the removal of the tumor all the more urgent.

Fibromata.—Fibromata sometimes develop in the labia majora or minora, or in the perineum, rarely in the urethra. If they attain any considerable size they become pedunculated and the pedicle can be cut without embarrassing hemorrhage.

Lipomata.—Lipomata are sometimes discovered in the labia majora. The treatment is the same as in other situations.

Enchondromata.—Enchondromata occasionally involve the clitoris.

Cancer of the Vulva.—Primary cancer of the vulva is rare. It assumes the form of epithelioma.

The disease appears as does cancer elsewhere. Small nodules, indurated and covered with thickened epithelium, make their appearance on the labium majus or the cleft between the large and small labia or about the clitoris; occasionally the origin is in the region of the meatus. These nodules soon lose their covering epithelium from the friction of scratching, since pruritus is an early symptom. The surface thus comes to produce a watery discharge, mixed later with blood, and having an extremely offensive, characteristic odor. The disease is not inclined to extend to the vagina. The inguinal glands are involved as the disease progresses.

Symptoms.—The nodules are discovered usually in the act of scratching, the pruritus being often intense. As ulceration proceeds the usual marasmic symptoms of cancer develop. The involved surface extends gradually, induration always surrounding the ulcer and preceding its extension. A bloody discharge is practically constant, and the usual friability of cancerous tissue is present. The margins of the ulcer are excavated. The inguinal glands are indurated. The odor, hemorrhage, restlessness, extending inflammation, and loss of sleep soon result in emaciation, and death ensues usually in one to three years.

Diagnosis.—The disease is to be differentiated from local tuberculosis, chancre, chancroid, papilloma, caruncle, and polypus. The odor of the discharge, the induration, the slow growth, the glandular involvement, the friability of the tissue, and the personal history will usually establish

the diagnosis. Suspected tissue can be easily excised and examined if there is doubt.

Treatment.—Treatment by escharotics and caustics should not be depended upon. The *x*-ray may cure cases discovered early, but here, as elsewhere, the malignant growth commonly comes under the physician's observation when it is already well advanced.

Total ablation of the growth should be resorted to when, in so doing, the operator can cut through healthy tissue. If not, curettage and application of the cautery at intervals help to keep the surface clean and at least postpone the end by lessening the degree of septic absorption. The raw surface should be washed frequently with a weak bichloride or other antiseptic solution and kept dusted with boracic acid or some such powder. The odor of iodoform is less offensive than that of the discharge, and it may sometimes be made a part of the dusting powder if desired.

When an operation is thought to promise the saving or the prolongation of life the method of its performance should be carefully planned in advance. No set procedure can be recommended; the ingenuity of the operator will be tested, not so much to remove the growth as to cover with good skin the denuded surface. The urethra especially must receive consideration, though it has been removed up to the neck of the bladder without consequent incontinence.

ELEPHANTIASIS VULVÆ.

Elephantiasis is a chronic enlargement due to connective-tissue hyperplasia with enlargement of the lymph spaces and nodes. In the genital region it may involve the clitoris, labia minora and labia majora, and may extend to adjacent parts. The affection may be limited to any one of the organs named. If the labia be the site the condition is usually unilateral. There may be hypertrophy of the entire derma or engorgement of the lymph vessels, or fibrous alterations in the lymph glands.

Symptoms.—There is interference with urination and, perhaps, with locomotion; the brawny surface ulcerates easily, giving rise to a foul discharge; the ulcerated surface heals with difficulty. Dyspareunia may be present, as may dragging pain in the pelvis. The surface of the tumor may be smooth or warty. The condition is more common in the negro than among white people. A history of syphilis is not uncommon.

Treatment.—The disease can be cured only by the knife. The hypertrophied organ should be cut away and the skin stitched over the raw surface. Hemorrhage is free, owing to the dilated vessels.

DISEASES OF THE VAGINA.

Vaginitis.—Vaginitis may be simple or gonorrhœal. Of simple vaginitis the following types are described: granular, adhesive, emphy-

sematous, diphtheritic, and senile. These distinctions, however, are of slight importance. In fact, the difference between simple and gonorrhœal vaginitis is one of etiology and degree of severity. They will not receive separate consideration. The vagina is lined with a membrane which may be looked upon as inverted skin. It is, therefore, much less liable to infection than mucous membrane elsewhere. Added to this source of immunity is that afforded by the vaginal secretion which is normally acid, except during menstruation and the puerperium.

Pathology.—The mucous membrane is at first red, swollen, and dry. The papillæ project as a result of small-cell infiltration and give to the involved surface a granular appearance. Soon local secretion is increased; it may be mucoid, mucopurulent, or purulent. The tops of the elevated papillæ are exfoliated and the surface becomes red and raw. These raw surfaces are usually localized spots. Often after the menopause, whether natural or artificial, the vaginal papillæ atrophy and the superficial squamous cells are desquamated in spots over the vaginal surface, leaving reddish patches which are tender and sometimes become raw. This condition is known as *senile vaginitis;* it causes contraction and consequently lessening of the calibre of the canal.[1]

Etiology.—Vaginitis is caused by trauma, by irritating discharges, as from a cancerous cervix or through fistulous openings into the rectum or bladder, by irritating douches, and especially by gonorrhœal infection. It is very often the extension of a vulvitis and not infrequently accompanies the exanthematous fevers. Personal filthiness, the gouty diathesis, and alcoholism predispose to it.

Symptoms.—Symptoms of simple vaginitis are pelvic heaviness, vaginal heat, itching and burning, leucorrhœa, and ardor urinæ with scalding. All these symptoms are aggravated by exercise. The degree of discomfort caused by them is much aggravated if the type be specific. In this latter case symptoms make their appearance in twenty-four to forty-eight hours after exposure, and immediately assume an acute phase. The local pain is commonly greater, the discharge very soon becomes purulent, excoriation comes on early, and usually appears first in the fornices, since the vaginal is very frequently secondary to cervical infection; urethritis is almost invariably present and pressure on the urethra will force out pus; the meatus, and in fact the whole vulva, frequently becomes œdematous. The inguinal lymphatics are prone to involvement and often suppurate.

It should never be forgotten that gonorrhœal infection is very dangerous to women, not on account of the local infection now under consideration, but because of the marked tendency to invade the uterus and tubes, where it becomes extremely prejudicial to health and even to life.

Diagnosis.—This can be made easily from examination and from the symptoms enumerated. After the diagnosis, however, the physician

[1] Gardes relates a case of vaginal gangrene from soft chancre, death resulting from uræmia.

should attempt to discover and remove the cause. For instance, by no means should he be satisfied with the mere diagnosis and treatment of the vaginitis itself when the cause is a vesicovaginal fistula. A vulvovaginal gland discharging into the vagina might be mistaken for a vaginitis. The differential diagnosis between simple and specific vaginitis is not always easy. The simple type may be present in severe form, while, on the other hand, it is really remarkable what little discomfort is often caused by gonorrhœal vaginitis. The discovery of gonococci in the discharge establishes a diagnosis as between the two types, but its absence does not negative such a diagnosis, for the germ may have disappeared from the secretion early in the disease.

Treatment.—For the ordinary simple vaginitis the use of a hot saturated boric acid douche three times in twenty-four hours, coupled with rest in bed and salines, is usually sufficient to effect a cure. The diet should be restricted and alkaline waters used freely. Hot sitz baths are of value. The simple type does not often become chronic. Should it do so the treatment below recommended for chronic vaginitis after gonorrhœa should be adopted.

In case it has been decided that the infection is specific, active measures should be resorted to. The boracic acid douche, if employed, must be used oftener—from six to a dozen times in twenty-four hours. After a week, if the acute symptoms have subsided, the douche may be given half as often and alternated with $\frac{1}{5000}$ bichloride; later the bichloride may be used exclusively if it be desired; or permanganate of potash, carbolic acid, or lysol may be used. From the first, or, better, after the first week, the vagina may, after being swabbed dry with the patient in the knee-chest posture, be painted with 2 to 5 per cent. silver nitrate solution twice weekly in addition to the treatment by douches only. Some use the silver nitrate solution when the patient is first seen and immediately pack the vagina with iodoform or borated gauze, changing the dressing twice daily, or oftener if necessary. Pryor, after using 2 to 4 per cent. solution of silver nitrate, packs the vagina with 10 per cent. iodoform gauze wrung out of $\frac{1}{5000}$ bichloride, which dressing he allows to remain for two days. He follows the removal of the gauze by $\frac{1}{5000}$ bichloride douches twice daily. He claims that this method of treatment lessens the liability to extension of the disease more than the treatment by douches only. Whatever plan of treatment is employed should be prosecuted for at least three weeks—usually longer—for the latency of gonorrhœa is well known.

If the vaginitis become chronic resort should be had to astringents. Silver nitrate (10 per cent.), zinc chloride ($\frac{1}{2}$ per cent.), and lead acetate (1 per cent.) are favorite remedies. Sulphate of zinc, alum, and tincture of iodine are of value. The solution of any of these astringents may be applied as a spray with much satisfaction.

For senile vaginitis lanolin will be found serviceable. Oils seem of more value than astringents in this form of the disease.

TUMORS OF THE VAGINA.

Tumors of the vagina are rare. They embrace cysts, fibroids, condylomata, and malignant growths.

Cysts.—The vaginal mucous membrane being the seat of few glands, one would not expect the frequent development of cysts. They are usually single. Their mode of origin is in dispute. The hypothesis that they usually spring from the remains of the Wolffian canal receives most support. It is claimed (Klebs) that they begin as dilated lymphatics; that they may spring from vaginal hæmatoma cannot be denied. They are almost always situated on the anterior wall.

Their contents may be serous, viscid, or purulent. Blood may also be present, changing the character and color of the fluid.

Symptoms.—The symptoms, as long as the contents are not infected, are mechanical, and are, therefore, dependent upon the size of the tumor.

Treatment.—Treatment consists in removal, the same care being exercised here as elsewhere to remove all the sac. When this is impossible from the high location of the tumor, or for other reasons, as much as possible should be dissected out, and the remaining part of the sac swabbed with carbolic acid and packed with gauze.

Fibroids.—Vaginal fibroids develop from the submucous connective tissue. They are usually situated anteriorly. It is the rule for them to become pedunculated as they grow. Their structure is the same as that of uterine fibroids. They are commonly quite small and have a tendency to ulcerate and slough.[1]

Their treatment is by removal. If sessile they can be enucleated; if polypoid the pedicle can be cut beyond ligatures.

Condylomata.—These usually represent the extension of like growths from the vulva. They are to be distinguished from papillary malignant growths. They should be removed with a sharp curette and the denuded base touched with the cautery.

Malignant Tumors.—It is seldom that a malignant growth in the vagina is not an extension from uterus, vulva, rectum, or urethra. These growths may be epitheliomatous or sarcomatous—usually the former.

Epithelioma.—Epithelioma, if primary in the vagina, usually originates in the region of the urethra or posteriorly. The symptoms are similar to the symptoms of cancer of the vulva (which see). The disease extends more rapidly, perhaps, here than elsewhere, so that the entire pelvic cellular tissue is soon involved and ulceration into the bladder or the rectum is not infrequent. In fact, treatment by incision is seldom warranted for the reason that the whole pelvis is involved before most patients are seen. In case the growth is located posteriorly and some promise is offered by operation it is well to remove the coccyx and the sacrum and resect a part of the rectum as well as the whole perineum, establishing such artificial anus as the condition may warrant. If it

[1] J. C. Da Costa reported a fibroid of the anterior vaginal wall six inches in diameter. Its removal was followed by recovery.

be thought wise to leave the posterior wall of the rectum it may in such cases be stitched to the anterior wall of the vagina, making a new canal of vaginal and rectal tissue. If the whole rectal circumference must be resected an artificial anus will have to be established in the sacral or inguinal region, according as little or much of the bowel longitudinally, has been removed.

As a matter of fact, nearly all patients affected with cancer of the vagina can be promised nothing more than can be gained from palliative treatment, which only should, in such cases, be resorted to. This is the same in principle as is recommended for cancer of the vulva.

VAGINISMUS.

Vaginismus is a hypersensitive condition of the external genitals, causing spasm of the levator ani and sphincter vaginæ. It is not uncommon in highly nervous young women. It is caused most frequently by an irritable, but only partially ruptured, hymen. It is caused also by inflamed carunculæ myrtiformes, fissures or small ulcerations about the introitus, or by a number of similar disturbing lesions. Sometimes, however, no such cause can be discovered.[1]

Symptoms.—Pain upon the slightest touch is the most prominent symptom. The suffering is severe, though it may be classed as neurotic. Vaginal examination to discover the cause of the trouble must usually be preceded by the local use of cocaine. Unless relief is obtained the patient becomes careworn and hysterical. The general health is correspondingly impaired. It should not be forgotten during the examination that uterine lesions or misplacements may occasionally cause the trouble.

Treatment.—This should have in view the removal of the cause, when the condition will not recur. If, as is usually the case, an unruptured or partially lacerated hymen be found it should be trimmed away with scissors and the raw edges thus made stitched together with a continuous catgut suture. Fissures and ulcers should be cauterized. Uterine displacement should be corrected by appropriate treatment. The patient is usually in a highly nervous state and she should be at once assured that she can be relieved. If the spasm should happen to be obstinate, Sims' glass plug for the vagina may be worn to advantage. If it cannot be borne resort may be had to section of the superficial fibres of the sphincter vaginæ.

Relief has been reported to follow section of the pubic nerve.

[1] J. T. Kelly reports a case of vaginismus due to a dislocated coccyx.

CHAPTER IX.

STERILITY.

By J. WESLEY BOVÉE, M.D.

Synonyms.—Barrenness; Infertility; Agenesia; Dysgenesis; Infecundity; Latin, Sterilitas Matrimonii; French, Stérilité; German, Unfruchtbarkeit.

Female sterility is a term implying the inability to bring forth a living child. It embraces two propositions—viz., impossibility of conception and inability to successfully complete the period of gestation. The latter does not mean inability to carry the products of conception for nine months—the usual term of gestation—but that the woman cannot give birth to a living child. Though pregnancy might be interrupted in the latter months and a living child be born, the term sterility could not be applied. If conception be impossible, then the term absolute sterility is employed to denote the condition. About 10 per cent. of married women are said to be absolutely sterile. Some women give birth to one or two living children and never afterward conceive. These are said to be relatively sterile. There are many women who have one living child and never again conceive. Others have been pregnant once, abortion terminating the pregnancy and no conception follows. To this class, including a very large number of women, has been given the name, one pregnancy sterility. During the childbearing life of a fertile woman there are periods of barrenness that are purely physiological. These are while she is nursing her newly born babe. At this time menstruation, as a rule, does not occur. After a few months, however, menstruation is more apt to occur and conception to follow. This is probably due to the function of the ovaries remaining dormant during the early part of the nursing period at least. Later, however, ovarian activity is resumed. But this is not always the case, such activity beginning promptly after the end of pregnancy and perhaps before menstruation occurs the woman again conceives. Before puberty and after the menopause, sterility is purely physiological. It must be remembered that women considered absolutely or relatively sterile for years conceive just before the menopausal cessation of ovarian activity.

Etiology.—Various general conditions have a direct causal relation to sterility. Among these may be mentioned extreme obesity, anæmia, gout, syphilis, chronic alcoholism, and spasmodic dysmenorrhœa. That alcohol has an effect upon the generative function is amply proven. Duncan mentions a case in which a woman markedly addicted to alcoholic intemperance and sterile became pregnant shortly after

becoming a total abstainer from it. Very fat women, as a rule, are sterile. Many of this kind after reduction of weight to an appreciable extent have overcome sterility. Herman mentions a patient, twenty-five years of age and two years married, without conception. She weighed 199 pounds and was but five feet in height. He reduced her weight twenty-eight pounds and pregnancy soon followed. Too frequent intercourse is another reason for infecundity. Witness the proverbial sterility of prostitutes. It influences the male fully as much as the female. Contrary to a common belief, sexual enjoyment probably in no way influences conception. Pregnancy has promptly followed rape and sexual intercourse while the female was unconscious. Repugnance to sexual relations has not proven a deterrant factor. To see women who never enjoyed the sexual act with large families is not uncommon. *Per contra*, strong sexual desire is apt to lead to over-indulgence in the sexual relations, which is considered, as already mentioned, a common cause of sterility. In many cases the fault lies with the husband. In others there is no fault in the woman or the husband. Each may be capable of procreation, but a certain incompatibility prevents them procreating together. This has been repeatedly demonstrated by breeders of animals. In instances the male known as a sure "getter" fails to impregnate the female after repeated trials, while the same female promptly conceives from another male of the same species. Cases are common in which a widower with children marries, and his wife fails of conception. The husband dies, and the widow, remarrying, becomes fertile. A noted instance is that of Napoleon and Josephine. This incompatability has thus far failed of explanation. Gross found the male is at fault in about 1 of every 6 cases and De Sinety 1 in every 4 cases of sterility. In the male the three chief causes of sterility are absence of living spermatozoa in the semen (though sexual power be otherwise excellent), absence of semen, and impotence.

A very potent cause is age. Matthews Duncan gives the following tables in evidence:

Age at marriage.	15–19.	20–24.	25–29.	30–34.	35–39.	40–44.	45–49.
Percentage of wives bearing children within two years of marriage	43.7	90.5	75.8	62.9	40.9	15.4	4.3

Age at marriage.	16.	17.	18.	19.
Percentage of wives bearing children within two years of marriage . .	12 9	30.0	46.4	57.8

This table shows the effect of too early marriage.

Thus it is seen fecundity is greatest in women married between the ages of twenty and twenty-four years, and that in those married younger than twenty years fecundity increases with age at marriage. After the age of twenty-four years fecundity proportionately decreases to the menopause.

As several organs, having individual functions, are involved in the process of conception, each of them must be considered in its relation to that process and the pathology of each as it influences sterility. In

the female the positively essential element for conception is the ovum formed in and expelled from the ovary. The normal process is the passage of the ovum from the ovary into the Fallopian tube, where it is met by the spermatozoön and impregnated, to be pushed on into the uterine cavity for development to full term and then expelled to the outer world through the vagina. Nor is its passage from the ovary a positively necessary preliminary process to conception. The five perfect specimens of ovarian pregnancy reported and microscopically demonstrated illustrate this fact.

Mention might here be made of the five cases of conception and successful delivery following supposed complete removal of both ovaries and both Fallopian tubes. These were reported by R. S. Sutton, S. C. Gordon, Ill and Harrison in this country, and an English writer. These demonstrate, at least hypothetically, that the Fallopian tubes are not essential to conception. Ovarian tissue must have been left and the remaining stump of the Fallopian tubes patulous or supernumerary tubes brought into service. Fritsch ligated both Fallopian tubes in the middle with silk and pregnancy followed three years later. Whether the ligatures cut through the tube leaving it patulous cannot be decided. The case reported by Ashton, of Philadelphia, in which pregnancy in the cervix followed removal of the body of the uterus for fibromata, also demonstrates absence of the body of the uterus is not a positive cause of sterility.

THE OVARIES.—Absence of the ovaries causes absolute sterility. It is possible, however, to remove the ovaries and pregnancy supervene. This of necessity implies ovulation a short time before operation and introduction of the spermatozoön into the genital canal within a few days before or after such action. The limit of time within which such ovulation and introduction of spermatozoa must occur has not been determined, though the evidence at hand would indicate it must be but a few days. The slightest degree of pathological change in the ovary or any other part of the female genitalia necessary to prevent conception has not been established. The amount of interference with proper ovulation that is a direct result of imperfect development of the ovary cannot well be determined unless it be extreme. Nor can any scientific method known be successfully employed to ascertain whether any given ovum is capable of being impregnated. No ovary can be so much involved pathologically as to justify a positive statement that it is no longer endowed with the power of maturing ova susceptible of being fructified. With these propositions in mind we may take up the various conditions of the ovary that may tend to produce sterility. These are:

1. Imperfect development.
2. The development of ovarian tumors.
3. Inflammation of the ovary.
4. Inflammations surrounding the ovary.
5. Interruption of the normal relation of the ovary and Fallopian tube.

1. Imperfect development, a condition usually associated with a similar condition of the tubes and uterus, and, perhaps, the vagina, tends to prevent the proper development of the ovum. Humiston, of Cleveland, has described this condition at length. Probably the degree of development of the ovum has more to do with sterility than has the number of them.

2. Any kind of ovarian tumors may in developing so encroach upon the parenchymatous portion of the organ as to smother out, as it were, the power of forming and casting out mature ova for fertilization. Large ovarian cysts, particularly when double, are commonly associated with sterility. Their development, as a rule, interferes with menstruation, often leading to amenorrhœa over long periods of time, or, on the other hand, to profuse and perhaps painful menstruation. Gallard studied 65 cases of ovarian cysts in their relation to the menstrual function. He found diminution of the flow or delay of its occurrence in every fifth case, and in every eighth, irregularity, pain, or increase of the flow. In sarcoma, carcinoma, or other solid tumor the function may be gradually destroyed or the whole organ so far removed from the fimbriated end of the Fallopian tube as to cause destruction of the ovum by the peritoneum before it can escape into the tube. I remember seeing a woman with the late William Goodell in which he had fourteen years before removed an ovary for an unusually large ovarian cyst. She had had several children since the operation, the last one being but a few months of age. She was suffering from another enormous cyst in the remaining ovary, which he removed. The various text-books that declare double ovarian cysts always produce absolute sterility are not in conformity with clinical observation. In more than twenty cases, double ovarian cysts have been removed during pregnancy. We should ever remember pregnancy often occurs when it seems almost a miracle.

3. Various forms of inflammation of the ovary occur and they tend to produce sterility by connective-tissue invasion of the parenchyma of the ovary and by the formation of such a dense layer of connective tissue on the periphery of the organ as to absolutely prevent extrusion of the ovum at the menstrual epoch. In one such case, in which as a last resort I removed the ovaries for dysmenorrhœa, the patient had been married at the age of twenty years, ten years before, and despite constant desire for children, had never conceived. Her family relations were such that the disappointment to herself and husband was intense to a degree as was their hopelessness.

4. Inflammation about the ovary may completely cover it with a connective-tissue capsule fastening it to other structures perhaps, and preventing an ovum, no matter how completely developed, from coming in contact with the Fallopian tube entrance. In such a condition the menstrual function may be nearly or quite normal, but conception is entirely impossible.

5. Many conditions may arise in the region of the ovary that markedly change the relation of this organ to the tube entrance—*i. e.*, broad ligament tumors, prolapsed and adherent spleen, intestinal and tubal

or uterine tumors, and extreme prolapse of the ovary may have a similar effect. When such conditions exists the digestive property of the peritoneum tends to destroy the ovum in its progress toward the Fallopian tube, as referred to above.

FALLOPIAN TUBES.—The conditions of the Fallopian tubes that may partially or completely prevent conception are manifold. Absence of these structures may be rarely found associated with other abnormalities of the female generative organs. Under such conditions sterility is to be expected in each instance. Lack of development is found less rarely and is very apt to cause sterility, particularly when associated with arrest of development in other generative structures. It is probable, however, that many Fallopian tubes not fully developed are present in child-bearing women. This condition is thought to be a fairly common cause of tubal pregnancy. Inflammation of the tube of any form is very liable to result in sterility. If of the mucosa the cilia are lost and pockets form which, if the inflammation has penetrated to submucous tissues, are bounded by connective-tissue barriers practically obliterating the lumen. Secretions may form in the tube that destroy ova or spermatozoa entering it. Again, the inflammation may be located about the fimbriated end, clubbing the fimbriæ and preventing their grasping the ovum expelled from the ovary. The fimbriated end may be found closed by the fimbriæ being infolded and the entrance closed by a plastic agglutination, or, the fimbriated end may be adherent to some surrounding structure, as intestine or broad ligament, for instance, the lumen being completely occluded. These are typical of the result of gonorrhœa. Such condition prevents the ovum and spermatozoön from contact with each other. However, should the fimbriæ be found embracing the ovary, even though adherent, pregnancy may occur. Goodell, Bouilly and others have demonstrated this. I have in one case seen pregnancy occur when double pus tubes were present and removed both tubes in the second month of gestation, the woman being delivered at full term. In such cases, however, the presence of supernumerary tubes must be considered as a possible factor in the process of conception.

New-growths forming in the tubes may occlude the lumen and interfere with the mobility of them. Probably tubal hemorrhage acts in this manner.

THE UTERUS.—This organ may be entirely absent. Abnormal development in the uterus may or may not be associated with a similar condition in its associated generative organs. If the mucosa be imperfect in development, sterility is liable to result. And yet pregnancy in a double uterus or some other form of arrested development of the organ is occasionally found. Endometritis is a common cause of sterility. The presence of the discharges in the uterus tends to destroy the spermatozoön, and, moreover, the fertile ovum finds lodgement difficult. Curettage in many cases of sterility with endometritis is followed fairly promptly by pregnancy. The presence of uterine tumors, such as fibroids, polypi, or malignant growths, usually have sterility associated with them. This may be due to the catarrh that usually follows. Never-

theless, pregnancy complicating them, with the exception of sarcomata, is far from uncommon. A narrow and perhaps angulated cervical canal is a frequent source of sterility in the newly married. This relation is emphasized if the external os uteri be very much narrowed. Hyperinvolution and subinvolution of the uterus seem to prevent conception. Malpositions of the uterus may have a similar result. Prolapse, flexion, or version of it have this tendency; the forward displacements are more common causes in the nulliparous and the backward and downward in those that have given birth to one or more children. When inflammation in one broad ligament has caused a lateral displacement of the uterus sterility may be expected. Whether cervical tears have any influence on future pregnancy seems doubtful. No doubt repair of such injury may be done in a manner that constricts the external os and thus tend to produce sterility. Amputation of the portio vaginalis does not seem to influence the possibility of future pregnancy, though it may tend to abortion. It may well be said here that tendency to abortion, whether habitual or otherwise, has an influence toward relative sterility.

THE VAGINA.—Various conditions of the vagina may cause sterility. Absence of this portion of the genital tract is sometimes found and usually associated with other conditions of arrested development. Absence of the uterus and appendages or a very slight development of them is usual with this vaginal defect when of the congenital form. Malformation of the vulva is also usual as evidence of nature's failure. The acquired variety is not commonly associated with other abnormalities in the other genital organs. It results from plastic vaginitis complicating some acute infectious disease as diphtheria or scarlatina. Sometimes the surfaces are not completely adherent, the upper end or a portion near the vulva being patulous. Partial or complete absence of the vagina, leaving no communication between the uterus and the vulva, ordinarily gives trouble from backing up of the menstrual discharge, and therefore calls for relief early in married life if not before it. Hence, its relation to sterility does not receive much consideration. If even a very narrow sinus passes by the constriction along which the menstrual and other uterine discharges may pass, months or years of married life may pass without the relation of the impediment to sterility being considered. Other malformations of the vagina, as extreme shortness, a much relaxed support with large introitus and double vagina may prevent conception. Double vagina is usually associated with double uterus, and sometimes in such condition lack of development of the tubes and of the ovaries makes matters worse.

Vaginitis is a prolific cause of infertility. The discharge from vaginitis is nearly always fatal to zoösperms, and unless some pass into the uterus promptly after sexual congress their vitality is lessened to a degree or entirely lost. In one case in my care a profuse vaginal discharge of pus had been present for years without pregnancy occurring. The woman had been treated during this time by douches and local applications. Upon examination an abscess was found in the right lateral wall of the vagina and extending from near the vulva to a point

slightly above the level of the tip of the cervix uteri. At that point pus oozed when slight pressure was made against the abscess wall. It was incised and packed successfully. Adhesive bands across the vagina from side to side or from the cervix to the vaginal wall may distort the vagina to a remarkable degree and may render intercourse so painful as to prohibit it.

Extensive laceration of the perineum may so shorten and straighten the vagina that the seminal discharges almost immediately flow from it.

Various fistulæ and sinuses of the vagina may prevent conception. Fecal and urinary discharges pouring into the vagina are usually considered sufficient to prevent pregnancy. A fistulous opening connecting with an ancient pus collection in the pelvis or with the intestine, particularly the small gut, may discharge enough material to kill all spermatozoa. And yet I have seen pregnancy occur in three of these conditions. In one instance the base of the bladder was so severely injured that passage of urine through the urethra had not occurred for years, yet a live child was born to this woman in her pitiable condition.

Tumors of the vaginal wall, whether solid or cystic, may so protrude as to fill the canal of the vagina. Even to less extent they may prevent normal sexual congress or passage of the semen to the vicinity of the entrance of the cervix. The hymen may be so rigid as to withstand all efforts toward intromission. This condition is due to an unusually liberal amount of connective tissue in this structure. It may gradually yield to external pressure and the formation of a pouch on the outer side of it, which serves for a receptacle for the seminal fluid. An imperforate hymen, like an occluded vagina, generally calls for relief before the question of childbearing is considered. The perforate, though complete hymen, may allow the passage of spermatozoa, and, therefore, sterility is not of necessity associated with an unyielding hymen. A large number of labors, during which the hymen has had to be ruptured, have been reported. Nevertheless pregnancy is not nearly so apt to occur with this handicap. Vaginismus, a condition of spasm of the vagina at attempt at intercourse, has a very important part to play in the causation of infertility. Various conditions of the vagina may cause this distressing condition. Chiefly among them is the presence of sensitive points in the carunculæ myrtiformes about the vaginal entrance. While sterility in vaginismus is not absolute, it is practically so.

THE VULVA.—The parts composing this structure may be absent in part as a result of arrested development. The labia may be united in the median line from plastic inflammation or from injuries. Various tumors may develop here. Elephantiasis Arabum may be markedly developed. All these conditions may practically prevent intercourse.

DYSPAREUNIA.—Consideration of the causes of sterility would not be complete without recognizing the importance of conditions that prevent complete sexual congress. Painful coition causes imperfection of the act and may even render it impossible. Various conditions may give rise to dyspareunia. Different forms of pelvic inflammations, retroflexion of the uterus with endometritis, prolapsed and congested ovaries,

particularly in neurotic women, urethral caruncle, urethral catarrh, cystic calculi, irritable nerve terminal filaments in the remnants of the hymen, and a host of other conditions might be mentioned as causes of this condition. One need not roam into the realm of sexual perversion for multiform conditions having a direct influence on prevention of sexual relations.

Very frequently sterility will be found to depend on the association of a number of the conditions previously mentioned. Endometritis is commonly associated with inflammatory conditions of the appendages or with uterine displacements. The appendages may be bound down by adhesions and yet not be enlarged and the endometritis so marked as to predominate. Vaginitis may exist with endometritis. Retrodisplacement of the uterus is frequently associated with pelvic adhesions about the appendages. A badly lacerated perineum may complicate any of these pathological conditions.

Diagnosis.—In considering diagnosis one must bear in mind it is not to decide whether sterility is present, as a rule, for that is plain enough. Usually the history of any given case affords that information. Though so strong a statement is the rule, exception is not uncommon. Take, for instance, such circumstances as previously mentioned, of the childless widow of a man having children by a former wife. She marries again and has children by that union.

Nevertheless, sterility having been proven, the skill of the physician is necessarily employed in discovering the conditions that have defeated nature in its efforts at procreation. It means a very careful inquiry into the history of the patient and into the physical conditions enumerated under the foregoing topic, etiology. These demand a thorough acquaintance with the life history of woman and a mature knowledge of normal as well as pathological conditions of her reproductive organs. Without these the physician can hardly hope to ascertain the cause or causes of barrenness except in the case of the grosser lesions. The minutiæ, here very important, are apt to escape his attention. After thoroughly studying the symptoms recourse must be had to a careful physical examination. First the vulva is to be carefully inspected, and then the vagina is to be examined both by touch and sight. Then palpation of the uterus and appendages. Careful notes should be made of everything that seems even slightly abnormal. Should anything abnormal be discovered, even though slight, ignoring it in forming conclusions as to reasons for sterility will be erroneous. One should get as thorough knowledge of the condition of the appendages as is possible. If there be a history of previous pelvic inflammation, occlusion of the tubes may be suspected and yet such condition be unrecognizable. Chronic inflammatory changes in the ovary may be suggested but cannot be positively diagnosed. Extreme caution is necessary in imparting to the interested parties the opinion formed from the investigation. It is advisable to know the relation borne by the husband to sterility of the wife. Before pronouncing her sterile we should satisfy ourselves of his reproductive capacity.

Prognosis.—After deciding what are the probable causes of the woman's infertility the probability of its relief must be considered. The general conditions of the individual, the generative incompatibility of the two parties as well as the variation of the individual reproductive wave, if such a thing be admitted, are conditions to be considered in every case. If one or more of them seem to be the only bar to success, then the prognosis should be very guarded. If removable pathological conditions be present we should ever bear in mind the possibility of their being complicated by the other conditions just mentioned. Nearness to the menopause renders success more remote, while the greatest promise is offered between the ages of twenty and twenty-four years. A very reliable rule would be to always be very guarded in giving an opinion as to relief of sterility. The exception to this rule would be when absence of the essential organs for maturing ova is positive or that the ova coming in contact with zoösperms is absolutely impossible.

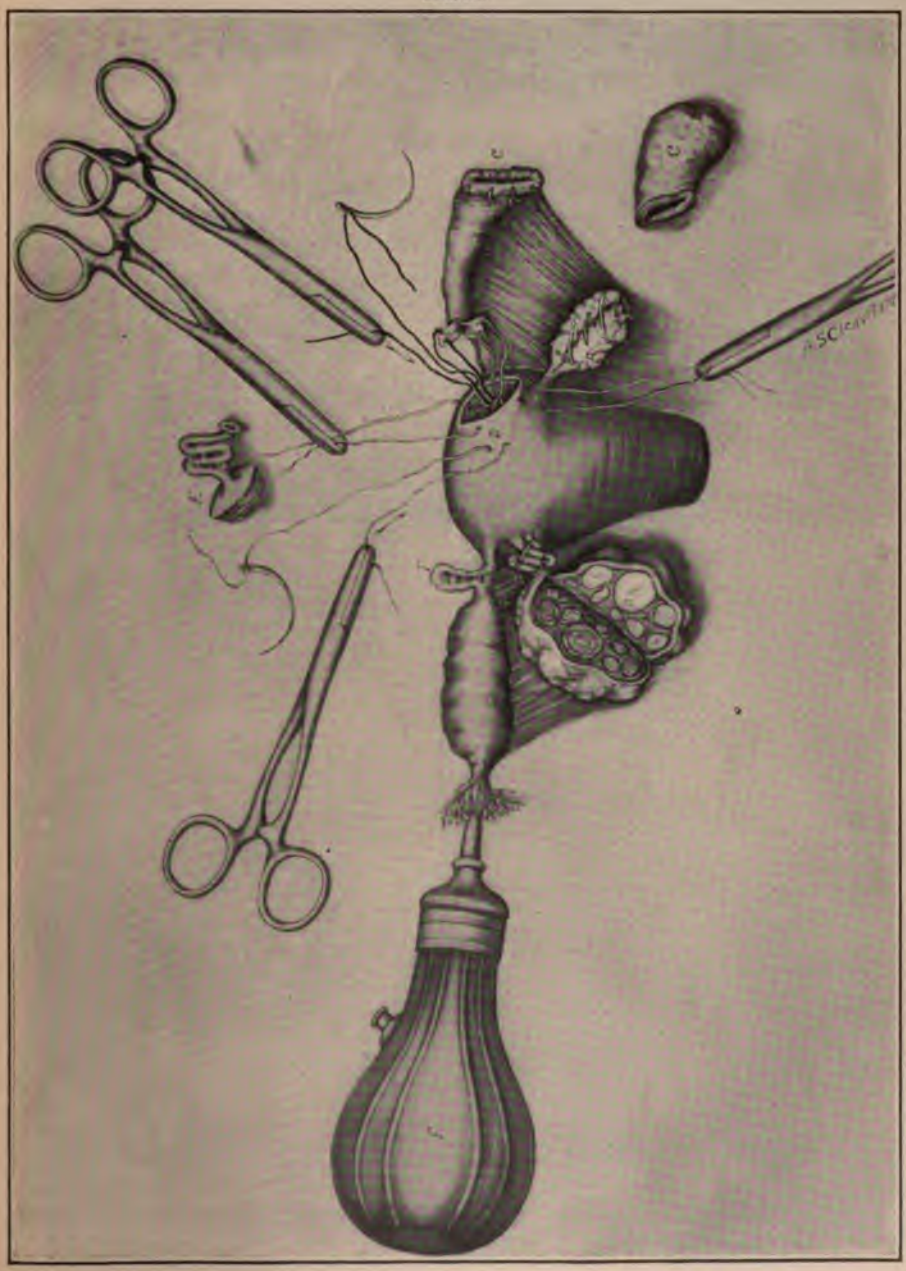
Treatment.—The treatment of sterility of the female consists of rendering her general condition as nearly normal as possible and correcting any vicious habit or physical defect in her reproductive organs. One of the strongest influences, the age at marriage, cannot be modified in any form, but should the patient be beyond the age of forty years when applying for treatment, the probability of success would necessarily be lessened, and, therefore, any severe surgical treatment would be less strongly indicated than at an earlier age. If syphilis, anæmia, obesity, gout, or any other general condition be present it should receive its appropriate treatment. It is not deemed necessary to here enter the minutiæ of such treatment. In chronic alcoholism, moral suasion, and the institution of environments calculated to lessen the tendency to indulgence are highly proper. The effect of such treatment, however, must always be conjectured, as one can never know just how much irreparable damage has been produced by the alcohol nor how much influence it has upon the lack of productiveness. Excessive coitus must be interdicted, as it undoubtedly weakens the nervous system of the woman and saps her vital energies. Probably its effect is still more injurious to the husband, as it not only reacts upon him as severely as upon the wife, but it renders the semen less potent by substituting a relatively small number of zoösperms, and these young and feeble, for thick semen, containing a large number of spermatozoa well endowed with vitality. Sexual congress should be limited to once in ten to fourteen days, particular attention being given to the greater liability to conception during the few days just preceding and following the menstrual period. It is better that copulation should occur twice within a few hours, with abstinence for ten days, than once every one or two days. General habits of living should be so regulated as to tax the least the strength and especially the nervous system of the woman. The proportion of neurasthenic women seems ever increasing. No doubt mode of living and vicious sexual habits are largely responsible for it. After removal of the conditions already mentioned our attention should be directed to any physical defect noted in the female generative organs.

Vaginitis, vulvitis, or endometritis must be appropriately treated. For endometritis a thorough cervical dilatation with curettage will be advisable, conception occurring a few months afterward being frequently observed. If dyspareunia be present its etiology must be determined and appropriate treatment applied. Urethral carunculæ or painful points in the carunculæ myrtiformes clipped off. Vaginal or vulvar ulcers, fissures or erosions should receive attention. Perineal lacerations require thorough repair and genital fistulæ to be closed. Growths about the vulva or vagina must be extirpated, though not much benefit can be expected in advanced elephantiasis Arabum. Vulvar closure sufficient to interfere with sexual congress must be treated by plastic surgery as must vaginal constrictions and occlusion. The narrowed cervical canal is best treated by thorough dilatation and curettage under general anæsthesia and cervical lacerations by trachelorrhaphy, or, in some cases, by amputation. Uterine displacements must be corrected if minor surgical intervention be found sufficient. Here the pessary may be employed as a temporizing agent. In many cases engorgement of the uterus or metritis is found, and hot vaginal douches properly used together with rest in bed for a few days will materially aid. Examination of the vaginal and cervical discharges at stated intervals of a few hours following coitus is practised in order to learn what effect the vaginal and uterine secretions have upon the zoösperms. If the series of microscopic examinations made during the course of treatment for such discharges show that spermatozoa are found gradually higher in the cervical canal or their mobility gradually increasing, comparatively speaking, then the treatment would seem to be correct. The converse, of course, is true. In some cases more severe surgical intervention will be justifiable—viz., where gross pelvic lesions are present and in some where pelvic adhesions are thought to cripple mobility of the appendages or to markedly interfere with their function. In the last-named class earnest solicitation of the wife and husband should justify the skilful pelvic surgeon in opening the abdomen and removing the supposed impediments to conception if possible. This work, however, should be undertaken only by the most skilful and does not form an indication for abdominal section as would the presence of a pus tube or an ovarian tumor. It should not be undertaken with less premeditation than the induction of abortion or premature labor. The conservative surgery of the appendages as so strongly advocated by Dudley, Polk, Goldspohn and others is markedly akin to this subject. Certainly, the surgical operation devised and performed by Alexander Hugh Ferguson, of Chicago, is planned to remove tubal occlusion at the isthmus (Fig. 149). It consists of liberating imprisoned appendages, distending the tubes to ascertain whether permeability of the isthmus exists. If not, the impermeable portion is removed and the cut end of the tube sutured into the uterine cornu so that its cavity directly connects with that of the uterus.

The subsequent history of such procedures has not been written. It remains to be determined whether such relief from sterility does not

tend to tubal pregnancy, as has followed in a case of my own. If that experience should prove to be not infrequent then the justifiability of such conservative surgery of the appendages might well be questioned.

FIG. 149



It is customary to mention artificial insemination by means of a syringe in all papers on the subject of treatment of sterility. This plan, devised by J. Marion Sims, is not only very distasteful but probably has no advantage over normal insemination. There is, however, a class of cases in which its use might be indicated, such as those wherein the male is, from perineal fistula, hypospadias, or other skin conditions unable to normally deposit semen in the vagina. John Hunter is said to have succeeded in one case. Its use is no longer customary.

CHAPTER X.

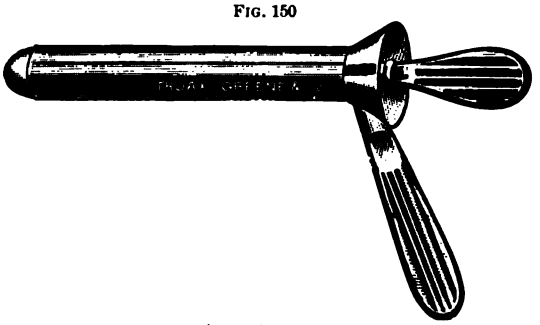
DISEASES OF THE RECTUM AND ANUS.

By J. WESLEY BOVÉE, M.D

PROCTITIS.

Inflammation of the rectum generally involves but the mucosa, except in the chronic form, and is due to some form of infectious agents, such as gonococci, pneumococci, and the Klebs-Loeffler bacillus. It may occur as a catarrh commonly associated with a similar condition in the colon. Pin-worms, impacted feces, severe purgation, or irritation from a neighboring neoplasm no doubt have a causal relation. Various forms of the disease, such as follicular and catarrhal, occur. And, of course, each form of infectious agent has its variety of inflammation.

Fig. 150



A proctoscope.

Symptoms.—In the acute form of the disease are noticed a sensation of burning pain in variable degrees, which radiates from the rectum and extends down the legs, frequent and painful expulsive effort, and the passage of mucus, blood, or pus in the passages. The anus may become extremely painful to touch, very red in color, contracted, with some prolapse of the rectal mucosa. Tenesmus frequently develops. In severe attacks the other pelvic organs become congested and furnish their characteristic symptoms. Constitutional symptoms, as fever, exhaustion, nervous excitability, and loss of appetite, soon appear. In chronic prostatitis the symptoms are less marked and are easily referable to other pelvic structures. Mucous discharges with the stools are noted. Intermittent diarrhœa or dysentery are not uncommon.

Pathology.—In the acute form there is intense engorgement and swelling—perhaps œdema of the mucosa. Raised patches of enlarged glands may be noticed, and slight strictures, particularly when syphilis or tuberculosis is present. In the chronic form the submucosa may be

infiltrated and more marked constrictions formed. A true catarrh may be developed.

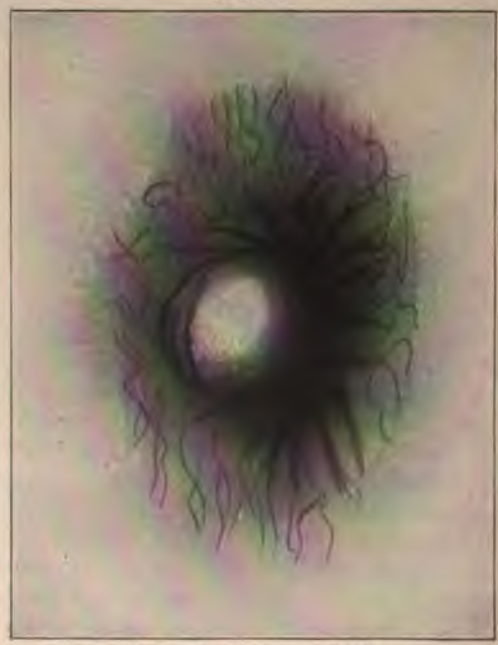
Diagnosis.—This is based upon the localized symptoms mentioned and the conditions found upon examination. These principally are the mucous, bloody, or purulent discharges, the reddened anus or the spasmodic sphincter, the deep red mucosa and perhaps catarrhal discharge.

Treatment.—The treatment consists of rest in bed, a very light diet, principally of liquids, such local treatment as frequent rectal irrigation, with very mild antiseptic and sedative solutions, stretching the sphincter ani muscle, and application of an ice-bag to the anus. Polypi, hemorrhoids, fissures, strictures, or any other causative or complicating condition must be properly addressed. The stools should be rendered very soft by salines by the mouth or rectum. Small ulcers or specially inflamed areas are to be painted with argyrol or some other silver salt in weak solution.

HEMORRHOIDS.

Hemorrhoids or piles are varicosities of the hemorrhoidal veins. They vary greatly in size and may be internal or external according to

FIG. 151



External venous hemorrhoid.

their development above or below the sphincter ani muscle. The external hemorrhoid is developed in the external hemorrhoidal veins

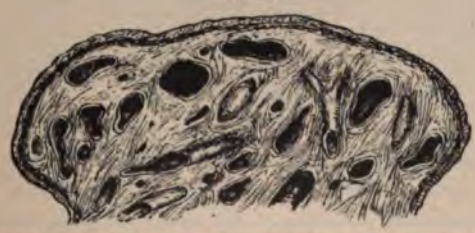
connected with the general venous circulation while the internal variety is developed in the middle hemorrhoidal vein and drained through the visceral veins. Neither variety is apt to alone exist, though in degree

FIG. 152

External cutaneous hemorrhoids.

they may vary very much. A large internal hemorrhoid may protrude through the sphincter ani muscle and appear as a red and tender rounded or irregular-shaped mass having a necrosed or thickened and

FIG. 153

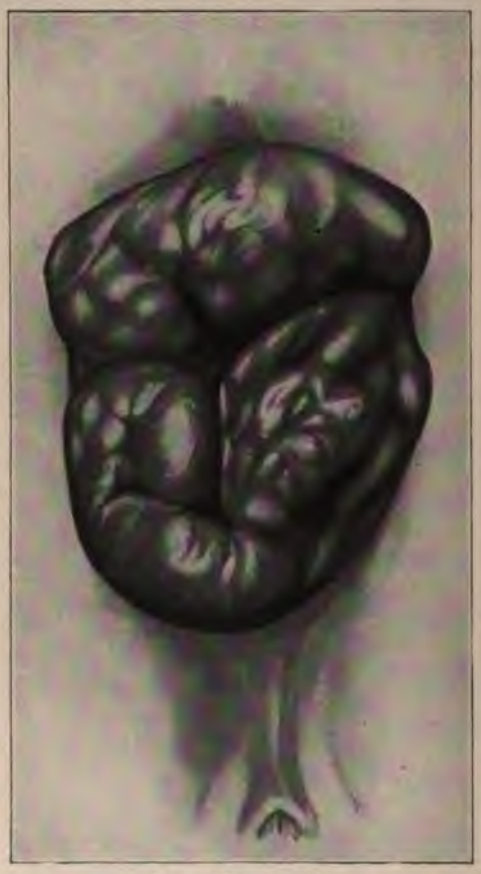


Section of external hemorrhoid with increase of connective tissue.

dense covering of mucosa. The external variety is covered by skin and perhaps partly by mucosa. They may occur singly or as a fringe about the anus. After some time they form in tags of infiltrated tissue.

Causes.—Hemorrhoids are very common and in most cases cannot be traced to any cause. Constipation, obstruction to venous blood currents, pregnancy, and straining at stool are the principal causes. Rectal stricture, inflamed or infiltrated uterosacral ligaments, and pelvic tumors are often found to have caused hemorrhoids by causing pressure stasis in the hemorrhoidal veins.

FIG. 154



Internal hemorrhoids.

Symptoms.—The external hemorrhoid commonly gives rise to few symptoms other than a slight sensitiveness after stool or when friction between it and clothing is made. By manipulation it may, however, become quite painful and even bleeding. Rarely they undergo suppuration with exaggerated symptoms. Frequent attacks are to be expected.

In internal hemorrhoids the small or capillary variety gives rise to hemorrhages, perhaps after each stool, and may lead to marked anæmia. The larger or venous species gives rise to marked symptoms that are

often referred to the female genitals. Among these may be mentioned severe bearing-down pains, pain in the sacral region darting down the legs, and bladder irritability. There is often a sensation of smarting or burning in the rectum and the passage of some blood at or following evacuations. When the hemorrhoids have become considerably enlarged

FIG. 155

Internal hemorrhoids, showing line of junction of the skin and mucous membrane.

they may protrude sufficiently to be caught in the grasp of the sphincter and thus give rise to marked pain that is relieved by pushing up the mass.

Diagnosis.—This depends entirely upon physical examination. No trouble is encountered in recognizing external hemorrhoids if the index finger be introduced into the sphincter and is found to be grasped on

every side, which demonstrates the extra-sphincteral attachment of the pile. If large, the internal hemorrhoid is easily recognized by a finger exploring the rectum. But if small they may elude the sense of touch.

FIG. 156

Inflamed fissure ani. *a*, sentinel pile.

In that event the rectal speculum or proctoscope must be inserted and ocular inspection made. In this manner even the smallest may be discovered.

Treatment.—Whenever a cause for piles can be found its elimination is a logical feature of the treatment of this condition. This varies largely, depending upon the character of the pile. Beyond question, most hemorrhoids may be dispersed if proper medical treatment be instituted early. This consists of rest in bed, the employment of saline cathartics or laxatives to the extent of producing two or three soft, semisolid stools daily, the avoidance of unnecessary food and stimulants, and the local application of an ice-bag. If the sphincter be thoroughly dilated under anæsthesia great assistance is made. In some mild cases, particularly when constipation is present, Boekel's metal rectal dilator has been of marked value in my experience. Many of them entirely recover when marked dilatation of the sphincter under anæsthesia is coupled with a proper amount of saline laxatives. When such remedies fail more severe means are necessary. The external pile should be exsected and the opening closed by buried absorbable sutures. This same method is often applicable to large internal hemorrhoids. A very important rule to be observed in removing piles is to never sacrifice any portion of the bowel wall that can be safely retained. The mucosa and submucosa should be dissected away from a pile before its removal whenever possible. The use of the clamp and cautery method is a favorite one of some, though many surgeons prefer excision of each pile separately, ligatures being employed. Whitehead and Marcy remove them by incising the mucocutaneous junction, separating the mucosa to above the hemorrhoids and ligating and dissecting away the hemorrhoids. Marcy by means of buried kangaroo tendon sutures coaptates the flap of mucosa, leaving no denuded area. This, I believe, is the best of the extensive operations. Whitehead makes no attempt to save the mucosal flap, but removes it, and, bringing down the mucosa, sutures it to the skin. The best I have found for less-marked cases has been the employment of the electrothermic angiotribe designed by A. J. Downes, of Philadelphia. This affords a bloodless and short operation and a practically painless convalescence. The sphincter should, as a rule, be thoroughly and gently dilated in any operation about the anus or rectum. When fissures complicate they should be distended and touched with some of the silver salts.

CARCINOMA.

This is one of the most fatal and frequent locations for cancer, being led in the latter respect by the uterus and mammary gland. It may involve any part of the organ and appear at any age above six years, though most common after forty years.

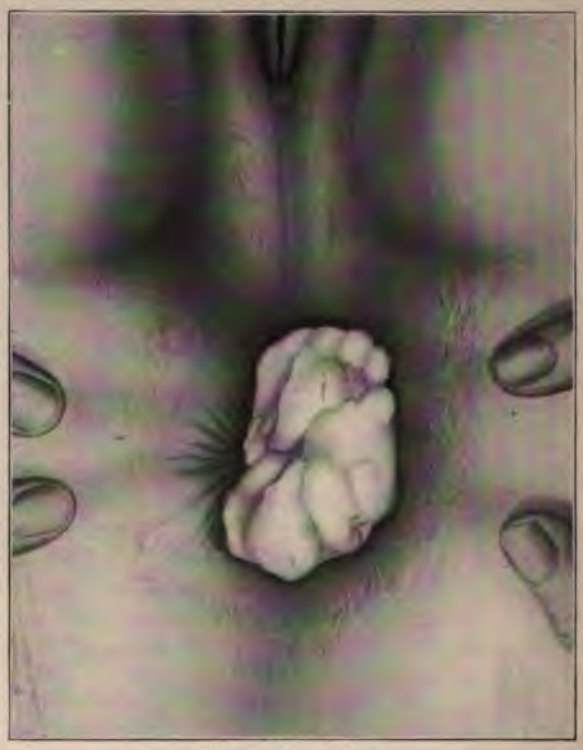
It is generally epithelioma or adenocarcinoma.

Symptoms.—These vary in intensity according to its nearness to the sphincter. High in the rectum it may give no symptoms before it has reached an absolutely hopeless stage in which obstruction or hemorrhage may require attention. Usually, this latter symptom is not marked.

When the disease is located near the sphincter it may give rise to severe pain, rectal tenesmus, constipation, and diarrhœa, and a continuous or intermittent foul-smelling discharge.

Diagnosis.—Early in the disease this is extremely difficult, even with the microscope, if the disease be high in the rectum. In the adenoma is recognized a tumor very apt to take on a malignant form and yet the exact time of such transition cannot be accurately determined by the microscope. One must depend upon the clinical history which is not clear early in the disease and only too clear in the later stages.

FIG. 157



Cancer of the rectum.

Treatment.—The treatment of rectal cancer is excision in the early part of its career and the use of palliative measures when rectal fixation from extension is evident. When the disease is located near the anus excision is to be made through the perineum or through the sacrum by either the method of Kraske, of Hochenegg, of Bardenheuer, or of Rydigier. When it is at or above the middle then the plan of Edebohls is far preferable. Murphy has removed it through the vagina. Rarely the remaining portions of the rectum may be united by suture. Usually an artificial anus must be established.

FIG. 158

Cancer of the rectum, showing the dilatation above the stricture.

NON-MALIGNANT GROWTHS.

Under this heading may be considered fibroma, lipoma, cystoma, polypus, vegetations, fungi, and condylomata. Of these the first three varieties are exceedingly rare and similar to those found in other localities. Polypi are quite common and their variation in structure makes necessary a division into the adenomatous, fibroid, mucous, villous, and glandular. They may spring from the mucosa and be composed entirely of that layer. Such are known as mucous polypi and are usually found in early life. If they contain elements from the submucous as well as the mucous membrane they may be villous, adenomatous, adenopapillomatous, or fibroid. All these are denser than the mucous polypi, and the fibrous has a hard and roughened surface. The mucous and fibrous are nearly globular in shape and have quite noticeable pedicles. They are usually single or at most but few in number. The villous

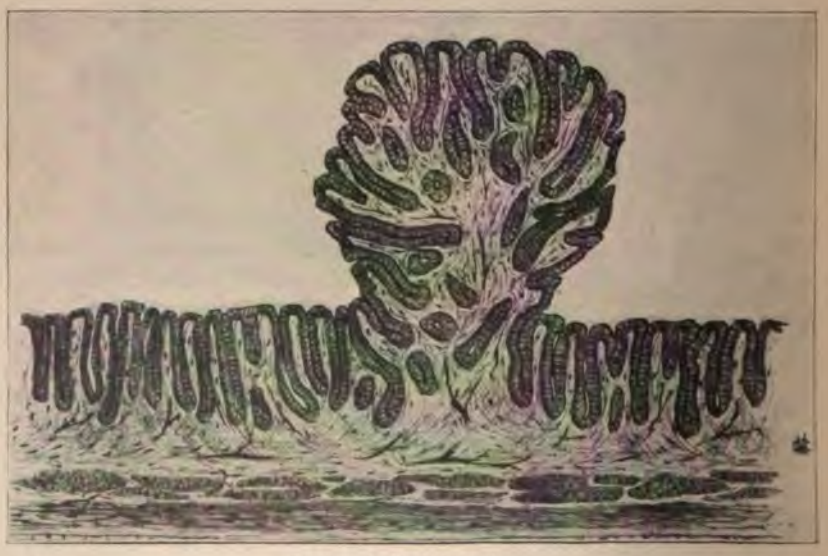
FIG. 159

Villous polypus.

FIG. 160

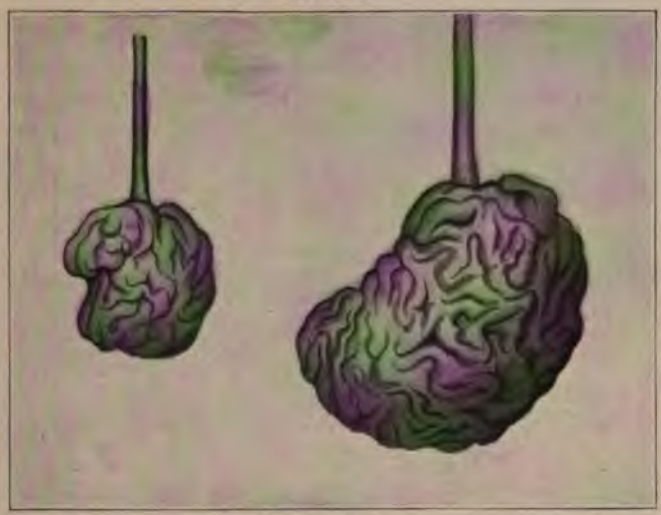
Glandular polypus.

FIG. 161



Section of glandular polypus.

FIG. 162



Fibrous polypi.

FIG. 163

Adenopapilloma.

FIG. 164

Fibrous polypus with attachment to mucous membrane.

FIG. 165

Non-syphilitic vegetations.

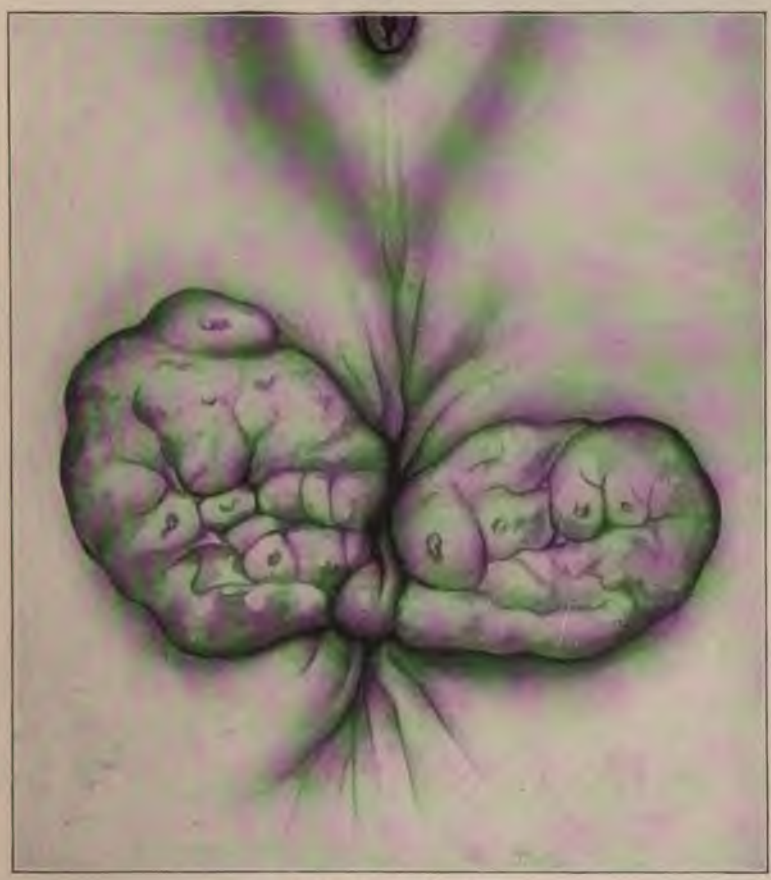
FIG. 166

Adenopapilloma.

polypi also are but few in number. The adenomatous and adeno-papillomatous varieties are usually smaller and present in large numbers, and are slenderer, being quite fusiform. The glandular is rounded, but pedunculated, and contains much viscid fluid. The villous variety attains large size, being in some instances three inches in diameter.

Symptoms.—All these growths sooner or later give rise to a rectal discharge that becomes purulent or bloody, according to the amount

FIG. 167



Syphilitic condylomata.

of erosion that almost surely occurs. Polypi may exist for months, if high in the rectum, without symptoms. If any of these tumors are within reach of the grasp of the sphincter they will be compressed and cause pain and discharge. Vegetations about the anus cause a constant discharge and pain when irritated, as by friction against clothing, toilet

paper, etc. Condylomata are especially prone to forming a markedly fetid discharge.

Diagnosis.—The diagnosis of pediculated growths and cysts of the rectum is not easy except with the microscope. The chief point to clear

FIG. 168

Chancroids of anus and vulva.

up is the presence or absence of malignancy. If a polypus is very soft and red it is merely of the mucous variety and not malignant. Vegetations and condylomata about the anus must cause one to attempt to determine whether syphilis or leucorrhœa or gonorrhœa is the first cause.

Treatment.—The proper management of any of these conditions necessarily embraces removal of them. Polypi, fibromata, lipomata, cystomata, and fungi require careful excision. Condylomata and vegetations may be removed by caustics and removal of the cause, such as

FIG. 169

Syphilitic condylomata.

gonorrhœa or leucorrhœa. If syphilitic the treatment of that disease becomes paramount. Rectal irrigation may be required for the discharge for the comfort of the patient.

NON-MALIGNANT ULCERS.

These are principally tuberculous, venereal, and dysenteric. Occasionally ulcers associated with catarrhal proctitis are noted and rarely are they due to injury. The tuberculous ulcer is slow in development, pale red in color, nearly painless, and tends to become deeper instead of broadening. It is surrounded by healthy tissue, but is usually accompanied by the same disease in some other portion of the intestinal canal. It may be recognized by these points and particularly as local treatment seems to be of little avail.

The venereal ulcer is usually phagedenic or chancroidal, though syphilis plays its part here as well. They are usually associated with

other expressions of the disease in neighboring structures. When due to sodomy other manifestations may be absent. When sodomy has been practised there are usually evidences of traumatism and marked dilatation of the sphincter ani muscle.

FIG. 170

Tuberculous ulceration of anus.

Dysenteric ulcers of the rectum result from fibrous infiltration of the rectal walls and consequent sloughing of portions of the mucosa, owing to interference with the blood supply. They are usually large and surrounded by indurated tissue. They may coalesce, making very large ones, and even perforate the bowel.

FIG. 171

Stricture from tuberculous ulceration.

Symptoms.—Severe pain and rectal discharge accompanies all forms of rectal ulcers except the tuberculous. Tenesmus is often marked and bladder tenesmus or spasmodic urethral stricture is not uncommon. There is sure to be a sense of burning and discomfort located in the rectum.

Diagnosis.—Careful digital examination will practically always discover the ulcer if present. The proctoscope will be of great aid in seeing them.

Treatment.—Careful cleanliness is a very important matter in the treatment, either preventive or curative. Local applications of silver salts, acetate of lead solution, antiseptic irrigation and rest in bed are most important. Semisolid bowel movements with consequent cleansing of the parts is important. Rest in bed should be required in any case. The cause of the ulcer should be searched out and remedied. The treatment is usually very tedious, but, as a rule, successful.

STRICTURE.

Strictures of the rectum, as in other portions of the body, vary widely in degree. They are caused principally by tuberculosis, syphilis, carcinoma, and chronic inflammation, such as is present in chronic dysentery. As rare causes may be mentioned destruction of portions of the rectal wall by pelvic abscess or by over-zeal in surgical operations and traumatism. Infiltration of the uterosacral ligaments has the effect often of markedly compressing the rectum, and chronic suppuration of some neighboring structure, such as the hip-joint, which gives rise to sinuses, may also cause them. In very nervous people spasmodic constriction is not uncommon.

Symptoms.—These are principally alternating diarrhœa and constipation, with difficulty of emptying the bowel, an early history of ulcer, and later ribbon-like stools, perhaps accompanied by straining. The ribbon-shaped stools may be due to spasm and never occurs when the stricture is near the sigmoid flexure, as the feces become packed in the rectum below. Evidence of intestinal dilatation and impaction above the stricture gradually comes on. Complete obstruction may occur, but is less apt if the strictured portion is fixed to the sacrum. Death is inevitable if the condition progresses unhampered.

Diagnosis.—The examining finger readily discovers the stricture, especially if fixation is present. Vaginal examination by the finger offers an opportunity to estimate the length of the stricture.

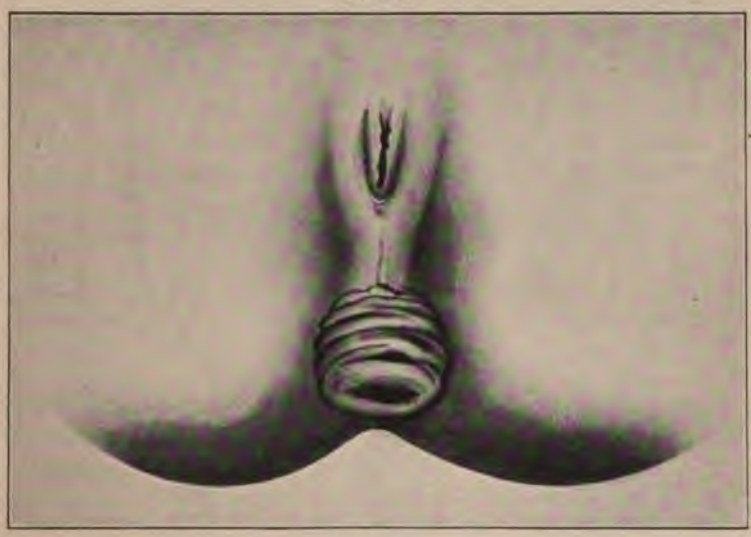
Treatment.—Regulation of the diet and bowel evacuations is necessary. Gentle laxatives and soap enemata will be needed in most cases to secure the latter. If the stricture is troublesome gradual dilatation with soft-rubber bougies, gently introduced and kept in place for several hours, often proves of great benefit. This treatment proves satisfactory in all but the severe types of the condition. In these linear incisions, excision or lateral anastomoses will be required.

PROLAPSUS RECTI.

Two forms of this condition are met, viz.: (1) prolapse of the mucosa alone, and (2) prolapse of all the coats of the rectum. The first form, by far the most common, is caused by straining at stool and relaxation of the submucous coat. When internal hemorrhoids encircling the

bowel become large they often protrude through the anus and produce a technical rectal prolapse. Polypi and other rectal growths have the same tendency. When from any cause the sphincter ani muscle becomes relaxed or for a considerable time dilated, prolapse of the mucosa is encouraged. From the former cause prolapse frequently occurs in infants and feeble children. It is gradual in development and appears as a reddened or purplish rounded mass at the anus, much as is noticed in the horse after each defecation. It is continuous with the skin and mucosa, and if the sphincter be not irritated to spasmodic contraction, is readily reducible. It usually occurs with each defecation and tends to become gradually more pronounced. Gradually the difficulty of reduction increases, and with this proportionately it becomes painful.

FIG. 172



Prolapse.

In exaggerated cases defecation is dreaded and constipation follows. The second form follows the first and is larger and of longer duration. If two to three inches of the bowel escapes through the anus it is very sure to carry with it peritoneum from at least the anterior side, and in exaggerated cases loops of small intestine may be included in the prolapsed peritoneum. The walls of the rectum become much thickened and the tumor points forward, owing to the firm attachment to the posterior vaginal wall. The mucosa becomes eroded and bleeding. Control of fecal matter becomes entirely lost in some cases and gradually the mass becomes irreducible. Rarely strangulation with sloughing occurs.

Treatment.—Reduction of the mass is usually the paramount detail of the treatment. This is best performed by placing the patient in the knee-chest position. If an operating table be convenient, placing the

patient on it in the Simon position and then elevating the buttocks, much as in the Trendelenburg posture, furnishes great assistance in reposition. The fingers or a piece of gauze well anointed may be employed for gentle taxis. Should the mass be too large for reduction by gentle taxis it may be diminished by application of acetozone and adrenalin, or 2 to 3 per cent. solution of alum. Relaxation of the

FIG. 173

Prolapse involving mucous membrane only.

sphincter is a necessary condition to the success of such applications. If severe inflammation be present it should be relieved by sedative antiseptic applications before taxis is employed. If the condition is complicated by sloughing the whole tumor had best be removed and the stump sutured to the sphincter ani. If these measures fail to prevent recurrence then some radical procedure should be attempted. Linear cauterization or removal of a portion of the mucosa on either side with

FIG. 174

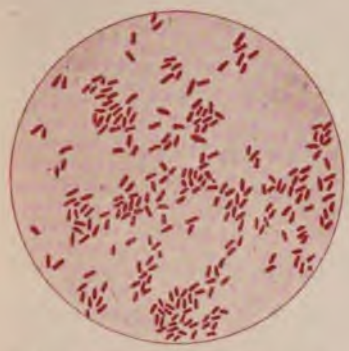
Prolapse involving all coats of bowel and peritoneum.

FIG. 175

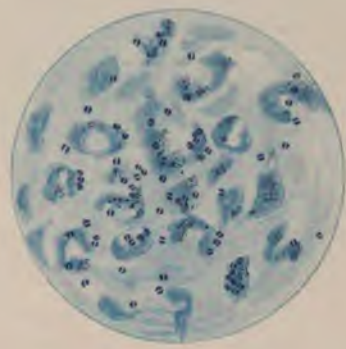
Prolapse with peritoneum opened.

suturing over the denuded area may be sufficient for a permanent cure. In marked cases these procedures will not be sufficient and abdominal fixation of the sigmoid or rectum may be needed. When retroversion with prolapse of the uterus has complicated rectal prolapse I have done hysteropexy and sutured the rectum to the posterior surface of the uterus with success.

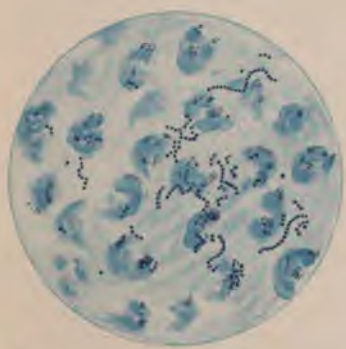
PLATE XVIII.



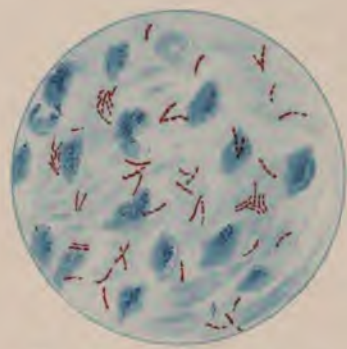
Bacillus Coli Communis.



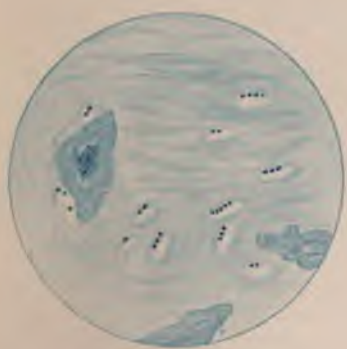
Gonococcus.



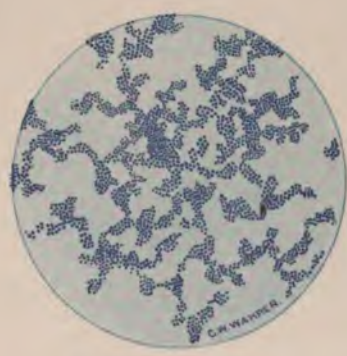
Streptococcus Pyogenes.



Bacillus Tuberculosis.



Pneumococcus.



Staphylococcus.

Magnified 1000 diameters. (Dudley.)

CHAPTER XI.

INFLAMMATIONS OF THE UTERUS.

By G. BROWN MILLER, M.D.

ENDOMETRITIS AND METRITIS.

CONSIDERABLE confusion prevails with regard to the causes, nature, symptoms, and treatment of inflammations of the uterus. Thus, we hear of endometritis due to masturbation, to misplacements, to catching cold at the menstrual period, to gastrointestinal catarrh, to run-down general health, etc., whereas there is no change of an inflammatory nature in the uterine mucosa in the majority of these cases. By some, every woman who says she has leucorrhœa is thought to have endometritis. It is this confused idea in regard to endometritis which leads to indiscriminate uterine applications, douchings, and curettage of women whose pelvic symptoms are frequently due to an impaired nutrition or some general disease. It is due largely to an ignorance of the etiology and pathology of endometritis, which will cause the ill-informed physician to burn away with caustics the comparatively normal epithelium which should lie in the cervical canal, but which as a result of a lacerated cervix is exposed to the eye of him who is seeking erosions, ulcerations, etc., of the cervix. It is deemed best, therefore, to regard only those cases which show actual inflammation as endometritis, and not apply the term loosely to hypertrophies and other changes in the endometrium due to misplacements, pelvic tumors, etc. Until one has a clear understanding with regard to the causes of uterine inflammation he cannot appreciate the symptomatology and indications for treatment in such cases.

Inflammations of the uterus—*i. e.*, endometritis and metritis—are, in the vast majority of instances, due to bacteria. While it cannot be denied that chemical irritation and trauma may produce a true inflammation of the uterine tissue, such cases are not common and are of comparatively little importance, unless there is a secondary invasion of bacteria. Catching cold at the menstrual period, misplacements, self-abuse, and many of the other so-called causes of endometritis produce probably only a congestion of the uterus, and unless bacteria are present they do not cause changes of an inflammatory nature. The presence of bacteria being then, as a rule, essential to uterine inflammation, it is advisable to say a few words with regard to the bacteriology of the female genital tract.

The vaginæ of both pregnant and non-pregnant women can be regarded as being, under normal conditions, free from pathogenic

bacteria. The *introitus vaginæ* is the outer boundary of this aseptic zone. The normal vagina contains its peculiar micro-organisms, but the pathogenic bacteria when introduced into it quickly disappear. The abnormal cases in which the vagina *may* contain pathogenic bacteria are cases of gonorrhœa; wound infections extending into the vagina; where the secretions of an infected uterus, an abscess, etc., are being emptied into this canal; those cases where the vagina contains dead nutrient media, such as carcinoma of the cervix with hemorrhage and necrosis, cases of retained placental tissue, submucous myomata, and uterine polypi; and in tuberculosis of the vagina.

The cavity of the corpus uteri is free from *all bacteria* under normal conditions, the boundary between the bacteria-containing and the bacteria-free zone being the external os uteri. The gonococcus and probably the bacillus of tuberculosis alone have the faculty, so far as we now know, of invading unaided the uterine cavity through the normal cervical canal; but under conditions similar to those mentioned in connection with the vagina, that is, a necrotic or patulous cervix accompanied by dead nutrient material in its canal along with resulting disturbance of the aseptic condition of the vagina, other bacteria, indeed, the streptococcus and staphylococcus pyogenes, may invade the uterus without their introduction by means of external agencies.

The uterus may be invaded by way of the Fallopian tubes, but only in cases where there is a true inflammation of these structures or of the peritoneum. Inflammatory processes of the endometrium resulting from bacterial invasion by this route occurs practically only in tuberculous peritonitis and salpingitis. Inflammatory processes may extend to the uterus from neighboring structures, that is, from the bladder, adherent intestine, neighboring connective tissue, inflamed tumors, ovarian abscesses, etc., and, finally, systemic infections may cause inflammation of the uterine tissue either by way of the lymphatics or bloodvessels.

Bacteria being the cause of uterine inflammation, in the vast majority of instances, it is more satisfactory to consider endometritis and metritis, acute and chronic, as some stage of infection. Inflammations of the uterus will therefore be considered from a bacteriological standpoint.

The three great classes of inflammatory conditions of the female genital tract from this standpoint are (1) gonorrhœal, (2) those conditions caused by pyogenic or saprophytic bacteria, and (3) tuberculosis.

While tuberculosis is not so common in the uterus as in the Fallopian tubes, we will follow this classification in the following chapter. To the three classes before mentioned may be added infections of the uterus due to specific causes of several of the infectious diseases, such as syphilis, cholera, typhoid fever, etc.

GONORRHŒAL INFLAMMATIONS OF THE UTERUS.

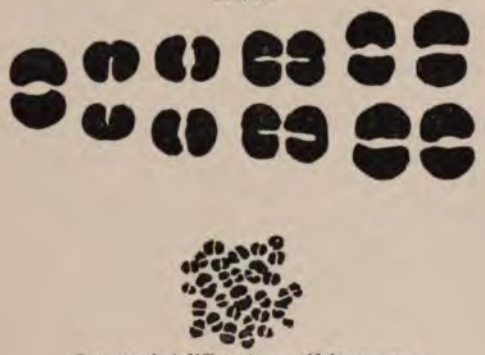
The most frequent cause of endometritis is gonorrhœa. The difficulties encountered in detecting the gonococcus in chronic cases are so

PLATE XIX.

Section through Decidua and Uterine Wall, showing Streptococci. (Doederlein.)

great that it is difficult to estimate just what percentage of uterine inflammations is due to this micro-organism. From both clinical and bacteriological observations gonorrhœal infections of the uterus occur far more frequently than the other forms. This frequency may be illustrated by the following statistics: Sanger found in 161 women who consulted him in his clinic for gynecological ailments, 18 per cent. of them infected with gonorrhœa (Fig. 176). Zweifel estimated that 10 per cent. of his gynecological private cases were suffering from gonorrhœa, and that a much larger percentage of those who came to his clinic were infected with the same disease. In 33 cases of endometritis examined by the writer in Kelly's clinic in Baltimore, 19 were regarded from both a bacteriological examination and clinical history as due to the gonococcus, 12 were probably puerperal in origin, and 2 were tuberculous. All of these cases showed definite endometritis on histological examination, 19 of them being acute cases. The gonococcus was actually found seven times.

FIG. 176



Gonococci at different magnifying power.

I estimate that at least two-thirds of all cases of acute inflammations of the uterus and its appendages in the dispensary services of large cities are due to gonorrhœa. In rural districts and among women of the wealthier classes the percentage is not so large, but probably is greater than that of any other kind of infection.

In pregnant women Oppenheimer, in 108 cases, found 27 per cent. infected with gonorrhœa; Schwarz, in 617 cases, 12.4 per cent.; and Lomer, in 32 cases, 28 per cent. It may be noted in this connection that a definite number of cases of puerperal infections are gonorrhœal in origin, and the gonococcus is likewise the cause of miscarriage in some cases.

The uterus is, next to the urethra, the most frequent seat of gonorrhœa in women. The infectious material is either brought directly in contact with the cervical canal in sexual intercourse or infects the uterus from the vaginal secretion. The cause of gonorrhœa is the gonococcus, which was discovered by Neisser in 1879. The form, staining peculiarities, and cultural qualities of the micro-organism are well

known, and will not be described here. The gonococcus has the faculty of infecting the mucous membrane with which it is brought in contact without any previous injury to their surface. In a great measure incapable of inoculating the skin or mucous membrane of the vagina, its favorite habitat is the more protected mucous membranes and the softer and more delicate the epithelial covering the more readily are they infected. The mucous membranes covered with cylindrical epithelium or soft-pavement epithelium are the favorite places of attack. Although, as before stated, the skin and the vagina of married women resist to a large degree its invasion, under favorable circumstances the organism may overcome their resistance. The tender vaginal mucosa of children is easily infected. The gonococcus possesses the faculty of being able to invade the cavity of the uterus through the previously healthy and undilated cervical canal. Once in the uterine cavity, it causes an acute endometritis, and generally extends from the uterus to the Fallopian tubes by direct extension along the mucosa. It is essentially an infecter of mucous membranes, although it has been found in a small number of cases in the uterine muscle, can cause a peritonitis, and, as is well established, at times, enters the general circulation and causes arthritis, endocarditis, etc. The acute endometritis set up by its invasion, after a time varying from a few weeks to several months, becomes chronic and the micro-organism, although very difficult to detect in this stage, frequently remains alive and capable of causing infection for years. This capability of the gonococcus of remaining alive in the mucous membranes for long periods of time is in marked contrast to the rapidity with which it dies in abscess cavities.

It is a mooted question whether or not the presence of the gonococcus favors the invasion of other bacteria. Secondary infections of the gonorrhœal uterus are seldom or never seen except under conditions which would allow these infections if the gonococcus were absent. Secondary infections with the staphylococcus, streptococcus, colon bacillus, and other bacteria may occur in gonorrhœal abscesses which communicate with the vagina or skin, such as Bartholin's abscess. In like manner ovarian or tubal abscesses which become adherent to the intestine may be secondarily infected from the intestinal tract, and the uterus may be in turn infected. In the puerperal uterus, and in carcinoma, etc., there is perhaps as great a likelihood of a secondary infection when the uterus is already the seat of gonorrhœa as when it is not. However, it may be safely stated that in gonorrhœal infections of the otherwise uninjured uterus, other bacteria are rarely if ever present.

Pathological Anatomy.—In the acute stage the mucous membrane of the uterus is inflamed looking, reddened, swollen, and bathed with a purulent secretion. Occasionally with a partial occlusion of the cervical canal a considerable amount of pus is dammed back into the uterine cavity, forming a pyometra. The uterus itself is larger and softer than normal. On histological examination one may find the surface epithelium wanting in places and in others having the form of pavement epithelium. Bumm states that the latter change is never found in the

glands, although these are at times infected. The uterine glands in a considerable percentage of the cases (Wertheim gives it as one-half) show hypertrophy and hyperplasia. The principal change in the mucosa consists in an enormous infiltration of the interglandular tissue or

FIG. 177

Chronic gonorrhœal endometritis.

FIG. 178

The same more highly magnified.

stroma with both round cells and polymorphonuclear leukocytes. The latter are seen wandering out toward the surface between the surface epithelium. In many cases the connective tissue of the uterine muscularis adjacent to the mucosa shows this cellular infiltration, and rarely small abscesses are found in the muscular wall of the uterus. There

is also an increase in the number and size of the bloodvessels. When stained for the gonococcus this micro-organism is found lying in groups between the epithelial cells and also in the subepithelial tissue in considerable numbers. The pus cells also contain them. The gonococci are seldom seen in the uterine muscle, and in sharp contradistinction to the streptococci seldom, if ever, penetrate the uterine wall by way of the lymphatics. The peritoneal covering of the uterus may show an acute inflammation with adherent intestines and omentum, but in these cases the bacteria have invaded the peritoneal cavity by way of the Fallopian tubes.

In *chronic* gonorrhœal infections of the uterus one finds microscopically little change in the endometrium or muscle. Microscopic examination shows the surface epithelium to be nearly normal. Occasionally at the top of a papilla or in a gland near its mouth over a limited area there is a change from the high cylindrical epithelium to several layers of flattened epithelium (Fig. 177). In such places the gonococci are likely to be found. The epithelium of the deeper portion of the glands is generally normal and the gonococci are absent here as a rule. Occasionally the glands become infected, instances of abscesses of the Nabothian follicles having been recorded. The subepithelial tissue of the mucosa is infiltrated with small round cells, this infiltration being more marked next the epithelium. An occasional leukocyte is found in the stroma or wandering out to the surface between the epithelial cells.

Symptoms and Diagnosis.—Gonorrhœa of the uterus being generally accompanied by an infection of the urethra, very frequently by a similar condition of the Fallopian tubes, and occasionally by one of the vulva, vagina, and Bartholin's glands, its symptoms form part of a chain due to involvement of these parts. The chief symptoms of an acute gonorrhœal endometritis are leucorrhœa, pain, a feeling of weight in the pelvis, backache, slight elevation of temperature, chilly sensations, a leukocytosis, and irregular menstruation.

The ordinary picture of an acute gonorrhœal infection of the *cervix* is an increased leucorrhœal discharge of a greenish-yellow color; there is slight pain in the pelvis, some tenderness in palpation, and a slight elevation of temperature. Inspection shows the cervix to be swollen with an eversion of the mucosa of its canal, and an area of reddening around the external os. The cervical glands may be infected and show an increase in size, and are occasionally filled with pus. The purulent secretion taken from the cervical canal when stained shows gonococci.

After the process invades the cavity of the *corpus* uteri there is pain, and aching through the loins, hips, and legs; the temperature is elevated (101° to 102.5°); the pulse is increased in rapidity; there are chilly sensations; the tongue is coated, and the patient feels ill. Exercise or sudden jarring causes an increase in the pain. The patient is usually constipated and suffers from frequent and painful micturition. Just how much these latter symptoms are due to an accompanying salpingitis and urethritis it is, as a rule, difficult to tell. A very frequent and significant symptom in acute gonorrhœal endometritis is prolonged and

frequent menstruation. The infection probably invades the uterine cavity at or immediately after a menstrual period, and it is usual to see a return of the flow in a short time. Palpation shows the uterus to be slightly enlarged, and extremely tender, the examination being usually unsatisfactory on account of rigidity of the abdominal muscles.

When the disease becomes chronic, leucorrhœa is the only marked symptom, as a rule, which is referable to the endometritis. There may be changes in menstruation, but these are not generally marked. Sterility is the rule, the cause being in the majority of cases the closure of the Fallopian tubes by the salpingitis, which so frequently accompanies the endometritis. Many think that when conception takes place in a gonorrhœal uterus miscarriage is liable to follow. Maslowsky[1] and Neumann[2] have reported cases where the gonococci were found in the decidua of women who had miscarried and they regarded the gonorrhœa to be the cause of the miscarriage. A certain number of pregnant women suffering from gonorrhœa are probably infected subsequent to conception, and in these cases there is great likelihood of a gonorrhœal puerperal infection. Krönig, in 179 patients who presented febrile puerperia, found the gonococcus in the lochia in 50 of them.

Course.—Most observers think that in a large majority of cases of cervical gonorrhœa the process remains localized, and that when the body of the uterus does become affected the disease does not extend to the tubes. My own experience leads me to believe that the opposite is the case and that the majority of cases of cervical gonorrhœa extends to the corpus uteri and finally to the tubes. However, it is certain that many women with gonorrhœa of the cervix conceive and bear children. The infection of the body of the uterus and of the tubes is favored by labor, by the introduction of sounds and other instruments into the uterine cavity, and occurs very frequently at the menstrual period. While the internal os and the narrow lumen of the Fallopian tubes do offer some obstruction to the invasion of the micro-organism they are anything but effectual barriers to them. The passage of a sound or curette carries the bacteria directly into the cavity. At the menstrual period the internal os is more patulous, the swollen mucosa of the uterine body may protrude into the cervical canal and thus be infected, and the menstrual blood during brisk movements of the body and marked variations in the abdominal pressure may regurgitate into the body from the cervix, thus carrying in the infection. The blood likewise affords a favorable culture medium for the growth and multiplication of the micro-organisms. In the puerperium the cervical canal is dilated, the same regurgitation is even more likely to occur and the lochia is the culture medium. It has been frequently observed that the micro-organisms are more numerous and apparently more virulent immediately after menstruation, and that the lochial discharge of women infected with gonorrhœa is full of the cocci, which appear larger and plumper than usual.

[1] Monatschr. f. Geb. u. Gyn., 1896, p. 212-218.

[2] Ibid., No. 14, p. 104-116.

The uterus of children with gonorrhœal vaginitis is seldom invaded, at least that is the usual opinion, and the rapid, favorable course of the disease in these patients without symptoms referable to the uterus would tend to confirm this opinion. Recently, I have seen a girl, six years of age, where not only the uterus was involved, as shown by stained specimens of the cervical secretion, but the gonorrhœal process had invaded the tubes and caused definite symptoms of localized peritonitis. There was a mass in the left lower abdomen corresponding to the tube. After six months the cervical secretion contains the gonococci.

Prognosis.—In the majority of cases of gonorrhœa in the female the process sooner or later involves the cervix. In 38 cases of acute gonorrhœa Fabry found the gonococci in the urethra alone twenty times, in the cervix and urethra sixteen times, and twice in the cervix alone. Brünseke and Seifert, in 200 cases of acute gonorrhœa, found in 90 per cent. of them the urethra involved, and in 37.5 per cent. an involvement of the cervix. The above figures apply only to acute cases.

Bumm, in 100 cases of chronic gonorrhœa, found the gonococci in the urethra alone in 6 of them, in both urethra and cervix in 37, and in the cervix alone in 57 of them. Thus the cervix was involved in 94 out of 100 cases of chronic gonorrhœa. In the same cases he states that the symptoms indicated that the body of the uterus was involved 54 and the tubes 43 times. In 55 other cases which he observed and had under his control and under treatment from the beginning of the disease, over a period of six months to one year, his figures show an astonishingly favorable result. (These cases included very mild as well as virulent infections.) Thus, in the 55 cases 91 per cent. had suffered from an infection of the urethra, 74 per cent. from a cervical endometritis, 14 per cent. from a corporeal endometritis, and only 3.6 per cent. from an involvement of the tubes. The same cases were kept under observation four years longer, and during that time 19 new cases were added to their number, the length of time of observation for the latter being more than one year.

At the end of four years he found that 93 per cent. had suffered with gonorrhœa of the urethra; 70 per cent. with gonorrhœa of the cervix; 16 per cent. with gonorrhœa of the corpus uteri; and in 10 per cent. the tubes were involved. Schnitt, in 116 cases of gonorrhœa in prostitutes, found 23 per cent. with involvement of the tubes. These figures show doubtless too low a percentage of tubal disease, as most of them must have been diagnosticated by bimanual palpation, and mild infection cannot always be discovered by examination. Again, a number probably developed salpingitis later. My own observations lead me to think that in our dispensary services more than 50 per cent. of women who come complaining of gonorrhœa sooner or later show involvement of the tubes. Doubtless the majority of cases of acute gonorrhœal endometritis get well under appropriate treatment, but most of our patients either will not carry out the proper treatment or the process extends in spite of it. When the process becomes chronic the prognosis for cure is not nearly so favorable, for although the gonococci disappear

in the larger number of cases, the genital organs of the woman in the majority of them remain crippled. The Fallopian tubes in most of these chronic cases are closed by the inflammatory process and sterility results. It is estimated by Bumm that 30 per cent. of cases of sterility are due to gonorrhœa in the woman. Grandin believes that 45 per cent. is a just estimate. These figures represent total sterility, a considerable number of women having the number of children which they bear limited by the infection, the tubes becoming closed after, perhaps, one or more labors.

Treatment.—In the majority of cases of acute gonorrhœa in women the process is at first limited to the urethra. If, then, on examination the cervix is found free from infection the utmost care should be taken to prevent the process from spreading to it from the urethra. This is best accomplished by carefully exposing the cervix and after thoroughly douching the vagina with an antiseptic solution (mercuric chloride solution 1 : 2000, etc.), tamponing the vagina with gauze saturated with ichthyol 1:100, protargol 1:200, or some other weak antiseptic solution. This tampon serves two purposes—namely, it prevents sexual intercourse and prevents the spread of the urethral infection to the cervical canal by way of the vagina. The patient should, if possible, be kept in bed and the urethritis treated at the same time by proper diet and medication. The tampons should be removed every few days and after douching the vagina they should be reapplied. When a menstrual period appears before the urethritis is well the tampons must be discontinued, the external genitalia should be frequently washed off with an antiseptic solution, and a vulval pad moistened with a similar solution applied. Sexual intercourse should be strictly forbidden and the man should, of course, receive treatment.

In acute gonorrhœa of the uterus the process is at first limited to the cervical canal, and the indication for treatment is to prevent its extension to the body of the uterus. This indication is best met by rest in bed, prohibition of sexual intercourse, and by the use of vaginal douches of antiseptic solutions or the applications to the cervix of tampons saturated with an antiseptic. This treatment should be kept up until the symptoms have disappeared and the gonococci are no longer to be found in the cervical secretions or until the process has become chronic. In the acute stage all applications to the cervical canal, the passage of sounds and curettage are contraindicated. When the symptoms indicate that the process has extended to the corpus uteri the treatment consists of an ice-bag or hot-water bag to the lower abdomen, hot vaginal douches, small doses of codeine or morphine to relieve pain, and absolute rest in bed.

When the process becomes chronic and is apparently confined to the cervix, local applications are indicated. The cervix is exposed by means of a speculum and the external os brought well into view, the tenaculum forceps being used if necessary. After cleansing its canal of its secretions an application of silver nitrate (1 to 5 per cent.), tincture of iodine, 10 per cent. protargol, and other antiseptic substances are to

be used to swab the cervical canal. The use of pledgets of cotton saturated with 5 to 10 per cent. ichthyol kept in contact with the cervix for several hours at a time by means of a vaginal tampon has been highly recommended. All eroded or markedly reddened areas should be touched with a strong solution of silver nitrate or a weak solution of zinc chloride, and suppurating Nabothian follicles should be emptied and their cavities swabbed with the same caustics. In the use of these escharotics an excess of the solution should not be in the swab, as it will flow over the adjacent parts and produce excoriations. When it is evidenced from the symptoms that the body of the uterus is involved and the tubes are not affected, or in cases of long-standing gonorrhœal endometritis with adherent appendages which cause no symptoms, intrauterine applications and irrigations may be used. It must be remembered that these are not free from danger, and the same precautions should be used to prevent the uterus becoming infected from other bacteria that would be employed in a curettage. At the first treatment, should the palpation of the tubes and ovaries be unsatisfactory, it is well to anæsthetize the patient and make a thorough examination of the pelvic structures. The cervix and vagina being cleansed, the former is caught with a tenaculum forceps and exposed by means of specula. The cervical secretions having been wiped away, a small dilator is introduced and the canal gently dilated. The uterine cavity is now irrigated for ten minutes with a silver nitrate solution 1:1000, or ichthyol 1:100. Care should be taken that the fluid is not pent up in the uterine cavity under pressure, as it may in such a case be forced into the tubes and cause a salpingitis or peritonitis. Applications of silver nitrate, ichthyol, tincture of iodine, etc., may be made by means of cotton and a uterine applicator. When, on examination, pus tubes or pelvic abscesses are found it is necessary to relieve this condition before treating the endometritis. In cases where the uterine appendages have been removed and the gonorrhœa persists in the endometrium it may be advisable to obliterate the uterine cavity by means of the curette and caustics, the cautery, or by atmokausis. Curettage followed by the application of silver nitrate or the tincture of iodine is indicated in chronic cases of gonorrhœal endometritis with polypi or a polypoid condition of the endometrium.

In cases of pregnancy with gonorrhœa of the cervix care must be exercised in the use of all treatment. In primiparæ antiseptic douches and the application of ichthyol to the external os can generally be used with safety and is quite effectual. Should their use be attended with symptoms of abortion we should content ourselves with keeping the vagina and vulva clean with frequent bathing. In multiparæ with gaping cervices there is more likelihood of abortion from douching, etc.; nevertheless it is generally advisable to use both the douches and tampons until symptoms of abortion arise. After labor or abortion the use of douches should be dispensed with and the woman kept quiet for four to five weeks, especially if she has a febrile puerperium. The husband should be warned beforehand of the likelihood of puerperal infection.

Especial care should be exercised after labor to prevent the infection to the eyes and genitalia of the infant and the eyes of the patient and her attendants.

ENDOMETRITIS DUE TO SAPROPHYTIC AND PYOGENIC BACTERIA.

The second great class of uterine inflammations consists of those due to the action of saprophytic or pyogenic bacteria, which gain entrance into the uterus at labor or miscarriage, are carried in at operative procedures upon this organ, or effect an entrance into the uterus by reason of some disturbance to its normal germicidal properties. As has been before stated, the cavity of the normal uterus from a point at or a little above the external os is free from bacteria of all kinds. With the exception of the gonococcus and probably the tubercle bacillus no other micro-organisms, so far as we know, can under normal conditions gain entrance to the endometrium, and in case such an entrance was effected the bacteria would doubtless be destroyed without producing pathological lesions. In certain conditions of the cervical canal and the vagina this property of the uterus is overcome and bacteria do invade the cervical canal and produce inflammatory changes in the endometrium. In cases of malignant new-growths of the cervix or corpus uteri with a patulous os and necrotic pieces of the tumor and stagnating blood lying in the vagina, cervical canal, and cavity of the uterus, or in cases of submucous fibromyomata, polypi, etc., where the same conditions prevail, bacteria frequently gain entrance into the uterine cavity and produce inflammatory processes. It is quite common in carcinoma of the cervix to find an endometritis resulting from an infection of the cancer. Uterine tumors which have become infected not through the cervical canal, but through the circulation, lymphatics or intestinal tract, may, by extension of the infection, cause inflammatory processes in the uterine wall and endometrium. In the same manner foreign bodies in the vagina, the bladder, or intestinal tract may indirectly cause an infection of the uterus. In inversion of the uterus there is great likelihood of endometritis and metritis. In nearly all cases of uterine inflammation in this class where the bacteria gain entrance through the endometrium, some trauma of this portion of the uterus is necessary in order that the bacteria producing the infection may gain a foothold. The injury may be received at labor or miscarriage may be due to operation on or treatment of the endometrium, to the ravages of a neoplasm, or to extension from some neighboring structure. In all cases coming in this class it has been conclusively demonstrated that the bacteria causing the infection are identical with those of producing wound infection. Hence, septic and saprophytic endometritis is nothing more nor less than wound infection caused by the introduction into the uterine cavity of pathogenic bacteria. The micro-organism which occurs most frequently in these cases is the streptococcus pyogenes. The staphylococcus, the colon bacillus, the

Klebs-Loeffler bacillus, the bacillus aërogenes capsulatus, the bacillus typhosus, and many unidentified bacteria of a saprophytic nature have likewise been found.

The most common and the most important form of endometritis in this class is the puerperal. The condition of the uterus immediately after labor, with its open cervical canal, its raw and oozing surface, its large, thrombosed placental sinuses, offers an easy entrance to bacteria, which may be brought into its cavity or into the vagina. The lochial discharge likewise affords an ideal culture media for the multiplication and development of the invading micro-organisms. Krönig, who examined bacteriologically 179 cases of puerperal endometritis, found the infecting micro-organism in 75 cases to be the streptococcus; in 50 cases, the gonococcus; in 4 cases, the staphylococcus; and in the remaining 50 cases, saprophytic bacteria. Williams, in his *Text-book of Obstetrics*, gives the following table as the result of bacteriological examination of the uterine lochia in 150 cases of his own whose temperature rose to 101° or more during the first ten days of the puerperium:

Streptococcus	31 cases.
" staphylococcus and bacilli	2 "
" and bacillus coli	5 "
" bacillus coli and gas bacillus	2 "
" staphylococcus, bacillus coli and bacillus typhosus	1 "
" staphylococcus, bacillus coli and gas bacillus	1 "
" and unidentified bacillus	2 "
Staphylococcus	4 "
Bacillus coli	11 "
Gonococcus	7 "
" and bacillus coli	1 "
Unidentified aërobic bacteria	4 "
" anaërobic bacteria	8 "
Bacillus diphtheriæ	1 "
" typhosus	1 "
Bacteria seen in cover-slips but which failed to grow	48 "
Absolutely sterile	25 "

The puerperal infections may be taken as the type of the other forms of endometritis belonging to this class. While the lesion in the uterus due to the increased size of the organ, its large thrombosed vessels, etc., are, as a rule, more marked than infections following operations, etc., yet the pathological changes are similar and much more is known of puerperal endometritis. In puerperal endometritis the lesions depend to a large extent upon the variety of the infecting micro-organisms and upon their virulence. When the infecting organism is a streptococcus of virulent type there is generally slight local change, the organism spreading rapidly through the lymphatics or thrombosed vessels and giving rise to parametritis, peritonitis, phlebitis, or a systemic infection. The streptococcus in these cases generally invades the uterine walls over a limited area, such as the placental site or through a lacerated cervix, and the slight changes seen at autopsy in fatal cases are in striking contrast to those which appear in endometritis caused by bacteria of less virulence. The endometrium is, as a rule, smooth and normal looking, and there is little or no odor to the uterine discharge. An

ill-developed zone of leukocytic infiltration is found beneath the surface on histological examination, but this is apparently no barrier to the invading streptococci, which are found penetrating the uterine wall and the surrounding tissue. The extension of the infection is chiefly by way of the lymphatics, but it also occurs through the tubes, through thrombosed bloodvessels, and at times through the circulating blood. The streptococcic uterine infections show a marked contrast to the gonorrhœal infections in the mode of extension. The tendency of the streptococci is to go directly through the uterine walls, causing peritonitis,

FIG. 179

Uterus from patient dying on tenth day from a pure streptococcic infection. (Jewett.)

which is generally localized by the intestines, omentum, bladder, and pelvic wall, which become adherent over the portion of the uterus involved, or to cause a parametritis or infection of the periuterine connective tissue. The micro-organisms may pass by way of the lymphatics behind the peritoneum and give rise to retroperitoneal infection. The exudates and abscesses caused by the streptococcus are generally asymmetrical, being found anterior, posterior, or lateral to the uterus. The walls of the great vessels are, at times, penetrating, causing phlebitis, thrombosis, etc., the same lesions being also caused by extension of infected

thrombi in the uterine wall. There is comparatively little tendency in streptococcic endometritis for the bacteria to spread along the Fallopian tubes, and pyosalpinx as a result of streptococcic endometritis seldom occurs. In such cases a general peritonitis is apt to result.

Very little is known concerning the lesions caused in the endometrium by the staphylococcus pyogenes. It probably produces more local reaction and more pus formation than the streptococcus and is much more likely to invade the surrounding periuterine tissue by way of the lymphatics. The tendency of this micro-organism here, as in other portions of the body, is toward the production of localized suppuration and of septicæmia and not to lymphangitis, which is so commonly seen in streptococcic infections (Fig. 180).

FIG. 180

Uterus from a patient dying on tenth day from a mixed infection—streptococcus and colon bacilli. (Jewett.)

When the colon bacillus, the bacillus aërogenes capsulatus, and the saprophytic bacteria are present alone or in combination with the streptococcus there is a greater local reaction than in the pure virulent streptococcic infections. The endometrium may be converted into a necrotic surface with an appearance resembling a diphtheritic membrane and the lochia into a purulent bloody discharge, with an offensive odor, and at times showing gas bubbles. There is an intense zone of leukocytic infiltration in the stroma which tends to limit the extension of the infection. Whether or not the colon bacillus and the saprophytic

bacteria ever infect the thrombosed vessels is not known, but such a condition has probably never been observed. They possibly do, at times, and by causing a decomposition of the clot favor embolism. They probably never produce a lymphangitis. Williams reports a case of mixed infection of the streptococcus and the colon bacillus where sections through the uterine wall showed the colon bacillus limited by the round-cell infiltration, while the streptococci had penetrated this zone. This limitation of the extension of the micro-organisms occurs also in cases of streptococcic and staphylococcic infections, where the organisms have little virulence. The streptococcic endometritis presents also, at times, the appearance of a diphtheritic membrane. With the penetration of the uterine muscle by the micro-organisms there is metritis as well as endometritis. Small abscesses form at times in the wall of the uterus, and rarely gangrenous portions of the uterine wall are extruded into the vagina. The latter occurs only after labor, and is doubtless due largely to necrosis produced by prolonged pressure by the fetus. The term *metritis dissecans* has been applied to it. When the peritoneal coat of the uterus is involved peritonitis is the result. It has been stated that in most of the fatal cases of septic endometritis death is due to the resulting peritonitis. The process is in many cases limited by the adhering intestines and omentum.

When the chronic state of the inflammation is reached the endometrium shows a round-cell infiltration and generally an increase in glandular tissue. The epithelial lining of the uterus occasionally shows in places a transition from the cylindrical cells to squamous cells. In a few reported cases this has been so marked that the epithelium resembles the mucous membrane of the vagina, and the term *psoriasis uteri* has been applied to the condition. In chronic metritis there is an increase in the connective tissue of the uterine wall and a thickening of the adventitia of the bloodvessels. Adhesions of the uterus to neighboring structures are found as a result of the peritonitis. The parametral exudates, which result from a streptococcic infection, may persist for years, the streptococci at times remaining alive and keeping up the uterine inflammation as well as the parametritis. In two of my own cases the streptococci were present and capable of culture at the end of six and twelve years respectively. In the less virulent infections the bacteria soon disappear and the uterus returns to its normal condition, or there results a chronic inflammatory condition, which may persist for months.

Symptoms and Course.—The first symptom and the one of greatest diagnostic value in septic or sapræmic infections of the uterus is fever. The earlier this begins after the trauma to the uterus and the higher the rise in temperature the more virulent, as a rule, is the disease. At or near the beginning of the rise of temperature there is generally a chill, and at times several of them. The elevation of temperature is variable, but in septic endometritis it rises to 102° to 104° soon after the chill, and generally remains elevated for a period varying from a few days to several weeks.

The uterine discharge is likewise variable. With a pure streptococcic infection there may be little change in the discharge. Microscopically, it contains pus cells and bacteria, but macroscopically there is little or nothing in it to indicate the presence of the bacteria. It has no odor, is not increased, as a rule, in amount, and may be diminished. When the colon bacillus or saprophytic bacteria are present it is purulent, has a stinking odor, and may present a frothy appearance. This is especially true in puerperal endometritis.

The pain is variable, but is usually not great as long as the infection is confined to the endometrium and uterine muscle. With the invasion of the peritoneum and periuterine tissue the pain is generally severe. In endometritis and neuritis the pain is confined chiefly to the pelvis, back, and legs. When a peritonitis results and with metastatic infections, one finds pain and tenderness corresponding to the sites of such processes.

The pulse is increased in rapidity and its character is of much value in diagnosticating the severity of the infection. The more rapid and thready the pulse the worse the prognosis.

The patient generally feels ill, there is malaise, anorexia, headache, and pains in the muscles. The uterus is generally larger and more doughy in consistency than it should be, and is tender to pressure. When peritonitis, septicæmia, or phlebitis are present its symptoms are added to those already present. Leukocytosis is perhaps always present, but the number of the leukocytes vary greatly in individual infections.

If the process remains limited to the cavity of the uterus the temperature gradually falls and the other symptoms abate. In the majority of the cases, however, the uterus is not restored to its normal condition at once, but remains for some time the seat of a subacute or chronic inflammation. The symptoms then resemble those of chronic gonorrhœal inflammation—*i. e.*, the uterus is enlarged, there is leucorrhœa, pain and dragging in the pelvis, and many of the so-called neurasthenic symptoms which are so frequently seen following labor or miscarriage are due to a chronic endometritis and metritis originating in a puerperal infection. Such women are irritable, nervous, hysterical, and influenced by conditions and impressions which would not affect a normal person. The menses are frequently profuse and irregular.

Diagnosis.—In the acute stage the diagnosis depends upon a history of some abrasion of the uterine mucosa, upon the fever, chills, leukocytosis, the general ill-feeling of the patient, and a bacteriological examination of the uterine discharge. When after labor, miscarriage, any abrasion of the uterine mucosa, or with submucous necrotic tumors, etc., the symptoms previously given arise, one should suspect the infection of the endometrium, and at once examine its secretions bacteriologically where this is feasible. This is more readily done, as one of the first indications for treatment is to irrigate the uterine cavity, and it is an easy matter at that time to make slides and cultures. With the symptoms of endometritis in cases where there has been no abrasion of the cervix or uterine mucosa, this form of endometritis can be ruled out, except in

the cases of new-growths of the endometrium, intrauterine submucous tumors, or where septic processes have extended to the uterus from neighboring structures.

Gonorrhœal inflammations can be differentiated by the accompanying urethritis, infection of Bartholin's glands, vaginitis, and, above all, by a microscopic examination of the cervical discharge. The blood examination is valuable in ruling out typhoid fever and malaria. One should also not neglect a careful general examination of the patient, as inflammatory processes in the lungs, the infectious diseases, etc., do at times occur during the puerperium or after operations upon the uterus.

In chronic cases the history is of the utmost importance, both in making a diagnosis and in affording indications for treatment. A persistently enlarged and tender uterus, accompanied by leucorrhœa and menstrual disturbances, following a labor or miscarriage is very significant. When a parametral exudate or pelvic adhesions are found in such a case the diagnosis of an old septic uterine infection can be made. The presence of uterine adhesions with normal tubes and ovaries is diagnostic of a streptococcic infection, as is likewise a pelvic exudate limited to one quadrant of the pelvic and of bone-like consistency. It is essential in the operative treatment of subacute or chronic uterine inflammation, accompanied by a like process of the pelvic structures, to distinguish between the streptococcic and processes due to the gonorrhœa and other less virulent micro-organisms. The chief distinguishing points may be remembered by keeping in mind the routes of extension and the action of the bacteria upon the various tissues. Thus, the gonorrhœal infections almost invariably extend along the mucous membranes causing purulent salpingitis, intraperitoneal abscesses, are generally bilateral, and do not, as a rule, date from labor, miscarriage, or operation. The streptococcic infections, on the other hand, extend generally through the lymphatics, involve the parametrium, do not, as a rule, cause pus tubes, are usually asymmetrical, lie beneath the peritoneum, are generally of bone-like hardness, and usually date from a labor, miscarriage, or some operation upon the uterus.

Prognosis.—The prognosis in acute infections of the uterus in this class of cases depends largely upon the kind and virulence of the bacteria causing the disease. In sapræmic cases the prognosis is good, for with proper treatment the symptoms soon subside. When the streptococcus or the staphylococcus is present the prognosis is not so favorable, for while the majority of the infected women do not die as a result of the infection, there is a considerable number of fatal cases, and a larger number in whom the uterus never returns to its normal condition or only after a long period of time. The prognosis as to immediate recovery depends upon the kind and virulence of the infecting cocci, upon the height of the fever, the character of the pulse, and the general condition of the patient. It may be stated, however, that streptococcic infections are the most serious cases in this class.

Treatment.—Prophylaxis is the most important part of the treatment in this form of uterine infections. The majority of the cases originate

in labor or miscarriage, and it is superfluous here to detail the precautions which should be taken in labor cases. A certain proportion of the infections arise after curettage, intrauterine applications, and soundings, and operations for intrauterine growths. The strictest aseptic precautions should be observed in all such procedures. Curettage is responsible for more cases of infection than is usually thought. Within the past year I have seen two cases of streptococcic parametritis which terminated fatally after operation, which arose from curettage several years before. The operation is so simple that many undertake it without exercising all possible care. It is a good plan in all intrauterine procedures, after cleansing the vagina, to catch the cervix with tenaculum forceps, expose the external os and thoroughly cleanse it with antiseptic swabs before introducing any instrument into its canal.

After the occurrence of the infection when the case is seen in the acute stage, the most satisfactory plan of procedure is to expose the cervix, cleanse it, and, after making cultures and slides from the uterine secretions, to thoroughly explore the cavity of the uterus. In labor cases, or where the cervix is patulous, this is best done with the finger, and when the finger cannot be introduced the blunt curette may be substituted for it. Pieces of necrotic tumor, adherent pieces of placenta, blood clots, etc., may thus be found and removed.

The cavity of the uterus should then be thoroughly irrigated with a very weak antiseptic solution, such as ½ per cent. boracic acid, or ½ per cent. lysol, and then lightly packed with iodoform gauze. In irrigating, the precautions should be taken to have a free return of the fluid and not to use one of sufficient strength to cause poisoning by absorption. It is well to follow the use of the antiseptic solution by one of sterile water to prevent any of the former from remaining in the uterus and thus be absorbed.

While this method of treatment has little or no influence upon those bacteria which have entered the tissues, it does bring away decomposing blood, pieces of placenta, etc., and thus favors cure in cases of sapræmia and all infections except the gonorrhœal and virulent streptococcic. The presence of the iodoform gauze has some influence upon the growth of all bacteria and checks decomposition. In cases of sapræmic endometritis the patient's condition is generally markedly improved by the irrigation, and in all cases I cannot see that any harm can arise from such a procedure.

The same rigid rules for rendering the vagina and cervix aseptic should be used in this method of treatment as in operation.

The use of the curette in these cases is useless, except to remove pieces of placenta, etc., and the use of the sharp curette is a distinctly dangerous procedure. A considerable number of cases of perforation of the uterus by the curette have occurred in puerperal cases, and in any case it opens up new areas where the infection may gain an entrance and tends to break down the protecting wall of round-cell infiltration. The iodoform gauze should be removed in twenty-four hours, and after this weak antiseptic vaginal douches should be given twice daily. The patient

should be kept upon a nourishing liquid diet and her bowels regulated, if necessary, by gentle laxatives. An ice-bag or a hot-water bag, applied over the pubes, tends to relieve pain. Alcohol is indicated and may be given in considerable quantities. Strychnine and other stimulants may be given if the pulse becomes very weak and rapid, and alcohol and cold sponging adds to the comfort of the patient. The value of the anti-streptococcic serum in suitable cases is still under discussion, but in purulent streptococcic infections should be given early in considerable amount, especially if it is evident that the process is spreading.

The question of hysterectomy for septic infections of the uterus has recently attracted much attention, but gynecologists have not agreed as to the advisability of the operation. In ceratin cases there is little doubt but what the removal of the uterus offers the best hope of cure. Examples of such cases are infected uterine tumors, where the operation is rendered advisable by the presence of the tumor. Even here, with a sloughing and infected tumor, where the cervix is patulous and the condition of the patient is not good, it may be better to wait. Some of the puerperal or postoperative cases, where the symptoms do not abate after the removal of placental tissue and clots, and where we can be reasonably certain that the process is confined to the uterus or the tissue immediately adjacent, may be saved by a hysterectomy, which not only removes the chief source of the infection but provides efficient drainage.

The great majority of the cases recover without this operation, and as it is extremely difficult to say in any individual case that there is not an infection, by thromboses, of the pelvic veins, of the peritoneum, or the circulation, the weight of opinion just now is opposed to hysterectomy in puerperal and postoperative septic endometritis. Schultze lays down the following rules as indications for the operation:

1. There must be a known source of infection in the uterus which cannot be successfully treated by way of the genital canal.

2. It must be known that in the uterus *alone* is the *source* of the infection which threatens life.

3. The existence of points of infection outside of the uterus, such as septic emboli and thrombi, must with reasonable certainty be ruled out.

In case hysterectomy is decided upon the vaginal operation is usually preferable. In cases where the uterus is the seat of a myoma of such a size as to render morcellation necessary the abdominal hysterectomy is to be preferred.

The treatment of the chronic inflammation of the uterus where the examination reveals nothing abnormal is usually symptomatic. The chief symptom being profuse and at times frequent menstruation, it is advisable to try the fluid extract of ergot in doses from 10 to 60 minims three times a day during the flow. Good results have been claimed from the use of the tincture of hydrastis canadensis, 20 to 25 drops three times a day. When the menorrhagia is not favorably influenced by medicines, curettage is the favorite treatment. The method of performing this operation is as follows: The patient is put in the lithotomy position, and after thoroughly cleansing the external genitals and the

vagina, the cervix is caught with a tenaculum forceps by its anterior lip. A posterior and an anterior retractor are used in exposing the cervix, which is then swabbed off with an antiseptic solution. The cervical canal is gently and slowly dilated by means of the rapid cervical dilators until it will easily admit a medium-sized sharp curette. The entire inner surface of the uterine cavity is curetted by long light strokes of the curette, the entire curetted material being saved for microscopic examination. The uterine cavity may be irrigated with sterile water or a mild antiseptic solution, followed by water, and the vagina packed with iodoform gauze. In dilating the cervix care should be taken to ascertain the direction of the cervical canal, cases having occurred where the dilator perforated the uterus when this organ was acutely flexed. When the uterus is soft and friable the cervix is easily torn in the dilatation and the uterine muscle easily penetrated by the curette. The vaginal pack is removed in twenty-four to forty-eight hours, and antiseptic vaginal douches given once daily for a few weeks. The patient is kept in bed seven to ten days. Leucorrhœa, which is another symptom, should be treated with vaginal douches. The neurasthenic symptoms, which are frequently so prominent, are to be treated by tonics, massage, and other appropriate measures.

In most of these cases the pelvic examination shows some deviation from the normal, and these have to be remedied before one can hope to cure his patient. Lacerations of the cervix and perineum, if considerable, should be repaired and misplacements of the uterus remedied either by operation or by pessaries. Old uterine adhesions and exudates and abscesses in the adjoining tissue must receive appropriate treatment.

TUBERCULOSIS OF THE UTERUS.

The third class of the inflammatory diseases of the uterus is tuberculosis. While this disease is not so common in the uterus as in the tubes, it is more so than was formerly thought, and stands naturally in a class by itself, distinct from gonorrhœal and septic infections. Tuberculosis forms from 2 to 8 per cent. of all cases of inflammation of the genital organs of women. The order of frequency of the organs affected, according to Williams, is as follows: the tubes, corpus uteri, ovaries, vagina, cervix uteri, and vulva. It is important to bear in mind that in virgins practically the only inflammation of the uterus, tubes, or ovaries is tuberculous in nature. This, of course, presumes that no operation has been performed upon the patient's genitalia and excludes inflammatory processes due to tumors or to extension from neighboring structures.

Tuberculosis of the Cervix.—Tuberculosis of the cervix is an extremely rare affection, Cullen having found only 3 cases in a period of over eight years in the Johns Hopkins Hospital, where all tissue removed at operation upon gynecological cases is systematically examined. Many cases of cervical tuberculosis doubtless escape recognition, being regarded as carcinoma or an inflammatory condition due to some cause other than

the true one. The condition is perhaps seldom primary, although it is possible for it to result from an infection coming by way of the vagina, from the semen of a tuberculous testicle, or from the bacilli having been introduced by fingers, instruments, or other foreign bodies. There is also no reason why the tuberculous process should not localize itself in the cervix from bacilli coming through the circulation, while the other organs of the body escape infection.

Pathological Anatomy.—In the early stages of tuberculosis of the vaginal portion of the cervix the affected area presents a reddened, irregular surface surrounded by a zone of hyperæmia, and occasionally in this reddened area can be seen a few miliary tubercles (small translucent, grayish nodules). On histological examination typical tuberculous tissue—*i. e.*, giant cells, epithelioid cells, and small round-cell infiltration is found. Later the affected area becomes ulcerated. This is generally seen surrounding the external os, and at times involving the entire *portio* and extending on to the vaginal wall. It generally has the appearance of a granulating wound with sharply defined and undermined edges. The surface has a yellowish color, with granular-looking areas of miliary tubercles, and these surrounded by vascular zones which bleed readily on touch. On palpation the portion involved is rough and can be easily mistaken for carcinoma. Later there may be more or less caseation superficially of the affected area. Histological examination reveals typical tuberculous tissue.

Symptoms.—The symptoms of cervical tuberculosis are in nowise characteristic. There is leucorrhœa, which may be blood-tinged; considerable hemorrhage may take place in sexual intercourse, douching, or digital examination; and late in the disease there may be a good deal of local pain.

Diagnosis.—The diagnosis is based largely upon the histological examination of the excised portions of the affected tissue, although an appearance and clinical history, such as has been described, should make one suspect tuberculosis.

Tuberculosis of the Endometrium.—Tuberculosis of the endometrium is much more common than that of the vaginal portion of the cervix. In a period of six years Cullen found in tissue from patients in the hospital previously mentioned over 40 cases of tuberculous endometritis. The process in the endometrium is usually secondary to tuberculosis in other portions of the body. As a fact, it is usually found in combination with tuberculosis of the Fallopian tubes and peritoneum, and its beginning, as it usually does, near the uterine cornu points to an infection chiefly through the Fallopian tubes. Although primary infection of the endometrium is uncommon, at least one authentic case is on record, and it is quite probable that certain cases arise from sexual intercourse with men who have tuberculosis of the testicle or seminal vesicles, by the introduction of the bacilli into the vagina by other means, or through the circulation.

Pathological Anatomy.—The disease usually begins near the uterine cornu and then gradually extends downward, involving the entire uterine

mucosa of the corpus and at times that of the cervix uteri. At first small firm elevations of a whitish or yellowish white color are noticed in the still intact mucosa. Later the mucous membrane presents an ulcerated appearance, the base of the ulcerated area being reddish in color, with slightly raised margins and often surrounded with discrete tubercles. Still later the entire uterine mucosa may be replaced by caseous material and the process involve the uterine muscle, occasionally extending through and involving the peritoneum.

"On histological examination the characteristic picture is present. Where the process is early the surface epithelium of the endometrium is still intact, but over the slightly raised areas is pale-staining and flattened. The uterine glands on the whole present the normal appearance. Scattered throughout the stroma, just beneath the surface, are pale-staining areas, consisting of little clusters of epithelioid cells. At other points large or small giant cells lie in close proximity to the glands, and here and there typical tubercles are present. On careful examination we have found that not only the stroma cells but also the gland epithelium takes part in the formation of epithelioid cells. As the disease advances the small tubercles become caseous and show infiltration with many polymorphonuclear leukocytes, while the stroma shows much small round-cell infiltration. The surface of the mucosa gradually disappears, being replaced by an ulcerated area consisting entirely of caseous material, beneath which is typical tuberculous tissue. After a time no mucous membrane remains, and the tubercles become scattered through the uterine muscle." (Cullen.)

Symptoms.—The symptoms are not characteristic. There is leucorrhœa and frequently menorrhagia and metrorrhagia. At times there is amenorrhœa. Later in the course of the disease there may be a discharge of blood-stained caseous material. Pain is usually present in the advanced cases or when there is an accompanying tuberculosis of the tubes and pelvic peritoneum. The pelvic examination may be entirely negative. The uterus may be enlarged, but this is not usually noticeable. The tubes and ovaries are generally adherent and enlarged. In women where puerperal and gonorrhœal pelvic infections can be ruled out, such a condition is in the large majority of the cases due to tuberculosis. In suspected cases one should carefully examine the lungs and the urine for evidences of the disease in other organs.

Diagnosis.—The diagnosis is based largely upon the microscopic examination of curetted material. The history of the case is important; in the absence of any evidence of gonorrhœal or septic infection and of pelvic tumors, an inflammatory condition of the appendages and a history of disturbances of menstruation should render the diagnosis fairly certain. In all cases of menorrhagia where a curettage is performed the scrapings should be examined microscopically, and in this way many cases of early tuberculosis and malignant diseases of the uterus will be diagnosed which would otherwise escape detection.

Treatment.—The treatment of tuberculosis of the uterus should be the removal of the whole of the uterus and tubes. Should the ovaries be

involved, these should also be removed. The abdominal hysterectomy is to be preferred in the majority of cases, for by it one can gain a better idea of the condition of the tubes, ovaries, and peritoneum. The tubes and peritoneum are involved in the tuberculous process in the majority of cases and can be better dealt with from above. Should the patient be suffering with general tuberculosis the operation is generally not justifiable. In such cases a vigorous curettage of the uterine cavity followed by the application of an iodoform gauze tampon can be used as a palliative measure. Antiseptic vaginal douches should also be used. When the lungs are involved it is a questionable procedure to administer an anæsthetic unless the symptoms urgently demand it.

Tuberculosis of the pregnant uterus may also occur. Kraus,[1] who describes a case, states that it may occur as a chronic process extending from the tubes, and as a miliary infection of the placenta and placental site. He states that a miliary infection of the endometrium in the pregnant uterus, except at the placental site, has never been observed. Tuberculosis of the puerperal uterus has likewise been observed and may arise from an extragenital focus by way of the circulation or through the Fallopian tubes in the usual manner.

DIPHTHERITIC ENDOMETRITIS.

The formation of a diphtheritic membrane in the vagina and the interior of the puerperal uterus has been frequently noted. Until recently this was thought to be due to the streptococcus, but undoubted cases of an infection by the bacillus diphtheriæ have been reported by Bumm, Widal, Doderlein, Williams and others. Cases have also been reported of clinical observation of diphtheritic endometritis of the non-puerperal uterus, but so far as I know these have not been confirmed by bacteriological examination. In these supposed cases the vagina was involved and the opportunity to obtain an uncontaminated culture from the uterine cavity has been wanting. The diagnosis depends largely upon bacteriological examination. When it is positive that the condition is present no time should be lost in the administration of the antidiphtheritic serum.

SYPHILITIC ENDOMETRITIS.

Very little is known concerning the changes produced in the endometrium by syphilis. In the non-impregnated uterus the pathological changes produced upon the uterine mucous membrane is not, as a rule, of sufficient degree to call overattention to it. There seems to be no reason why the lesions which occur in the other mucous membranes should not also be found in the uterus. Recently in the Emergency Hospital Dispensary a patient suffering from secondary syphilis had a

[1] Zeitschr. f. Geb. u. Gyn., Band lii., Heft 3.

discharge of a dark, grumous nature for several weeks, unaccountable except as due to syphilis. When conception takes place syphilis makes itself apparent in a pronounced manner. It is a well-known cause of miscarriage-producing changes in the placenta and decidua which bring about this result.

ENDOMETRITIS IN THE ACUTE INFECTIOUS DISEASES, POISONING, ETC.

Numerous instances of endometritis as a result of phosphorus poisoning, burns, and the acute infectious diseases have been reported, but our knowledge of the true lesions produced in the endometrium by these diseases is quite limited. Leopold and Landau have reported cases of acute endometritis from phosphorus poisoning. The investigations of Slavjansky in 1870, during an epidemic of cholera in St. Petersburg, showed certain pathological lesions of the endometrium which have been since confirmed by other investigations. The mucous membrane in these cases showed the following condition:

The surface epithelium showed cloudy swelling and in places was wanting; there was marked hyperæmia, the bloodvessels being engorged; extravasation of blood was seen in the stroma in places; and small round-cell infiltration was present. In consequence of an extensive extravasation of blood beneath the epithelium there resulted an exfoliation of mucous membrane which at times was extensive. Investigations of the condition of the mucous membrane of the uterus in typhus and typhoid fevers, pneumonia, and dysentery by Massin[1] show similar changes in these diseases as the ones described by Slavjansky in cholera. Similar changes have been observed in influenza. The change in the uterine mucosa in these diseases is perhaps not a true inflammation, but a pronounced congestion with extravasation of blood. In pregnant women they frequently produce premature delivery, and in both puerperal and non-pregnant women there is a marked tendency to uterine hemorrhage. No case of pyosalpinx or pyometra has perhaps ever been observed, and if these diseases had caused a true inflammation of the endometrium such conditions would probably have come to light.

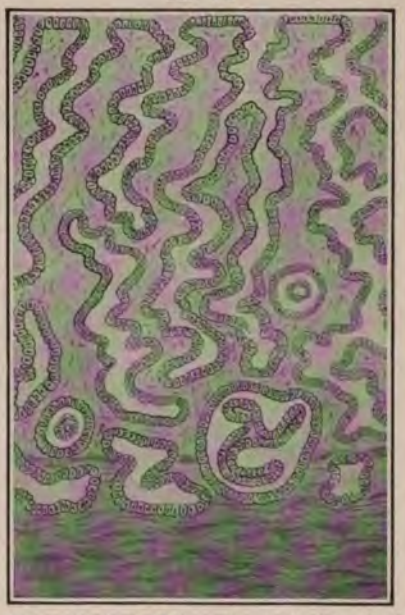
HYPERPLASIA OF THE ENDOMETRIUM, POLYPOID ENDOMETRITIS (SO CALLED).

This condition which is usually considered as endometritis may be the end result of an infection of the uterine mucosa, but is oftener due to the influence of myomata, ovarian tumors, malpositions of the uterus, perhaps, at times, to nervous influences, and to certain general diseases. The increased blood supply to the uterus which frequently takes place

[1] Archiv. f. Gyn. Bd. xl. p. 146.

in such conditions, and, of equal importance, the interference with the return circulation, leads by overfilling of the bloodvessels to hyperplasia of the uterine tissues and to the fungous condition of the mucosa found in such cases. Marked retroflexions lead to compression and twisting of the vessels which run in the broad ligament and in this manner to overfilling of the uterine vessels, which ends in hyperplasia of the uterine tissue, especially the endometrium. A more important part is played by tumors of the uterus, especially the fibromyomata. The increased flow at the menstrual period in some of these cases which, at times, results in hemorrhage so profuse as to seriously threaten the life of the patient, is due largely to changes produced in the uterine mucosa by the tumor. Carcinoma and sarcoma of the uterus frequently lead to this condition of the endometrium, while ovarian cysts and diseased ovaries, both by disturbance of the circulation and, perhaps, by some unknown relation between the ovary and uterus produce the same results. Masturbation and perverted or incomplete sexual intercourse are thought to produce a disturbed circulatory condition of the uterus and finally to hyperplasia of the endometrium. Lastly, disturbances in the circulation due to heart disease, cirrhosis of the liver, tumors of the spleen, obstinate constipation, etc., tend to produce the same condition.

FIG. 181



Hyperplastic glandular endometritis. The glands are increased in size and number, greatly tortuous, and dip decidedly into the muscularis. The interglandular spaces are much decreased. This condition sometimes is called benign adenoma. Semidiagrammatic. (Dudley.)

Pathological Anatomy. — The changes in this condition are especially marked in the uterine glands. They, at times, form polypoid excrescences on the surface of the mucosa which is thicker than normal. The uterus is generally larger than it should be and the vessels may be quite noticeable in section. On microscopic examination the most striking part of the field is the large number of cross-sections of the glands. These may be in every other respect normal, but in certain forms of the condition the glands are dilated. The picture, at times, gives the impression of an adenoma. The epithelium is unchanged and the condition is thus easily distinguished from adenocarcinoma of the uterus. There is generally an increase in the connective tissue in both endometrium and uterine muscle (Fig. 181). There is no evidence of an inflammatory process actually going on, and the tissue is free from bacteria. Hence, although

as before stated it may be the result of an infection, it is deemed better to put it in a class by itself and not consider it as endometritis.

Symptoms. — The symptoms of such a condition are, in a great measure, due to the cause. Menorrhagia and metrorrhagia are, however, symptoms which are dependent, as a rule, on the changes in the mucosa.

Treatment.—The first indication for treatment is to remove the cause if possible. Malpositions of the uterus should be remedied, tumors enucleated, and general conditions, such as heart lesions, etc., should receive appropriate treatment. The most effectual remedy for the uterine hemorrhage is curettage.

EROSION OF THE CERVIX.

Erosion of the cervix is a misnomer, as the name is applied not to a loss of substance of the cervix to an eroded area of this part of the uterus, but to a condition which careful histological examination has shown to be the existence of cylindrical epithelium where we normally find the squamous-cell mucous membrane. The squamous-cell mucous membrane of the vaginal portion of the cervix extends, as a rule, to or a little inside the external os uteri. In erosion this form of epithelium is replaced by cylindrical cells of the nature of those lining the cervical canal. There is generally a tendency to glazed formation by an ingrowth of this cylindrical epithelium into the cervical connective tissue accompanied by an outgrowth of the interglandular connective tissue, this giving rise to the follicular and papillary erosions. Whether the condition is congenital or is the result of an inflammatory condition of the cervix is not settled. The same term is, at times, incorrectly applied to an *eversion* or turning out of the epithelium of the cervical canal due to lacerations.

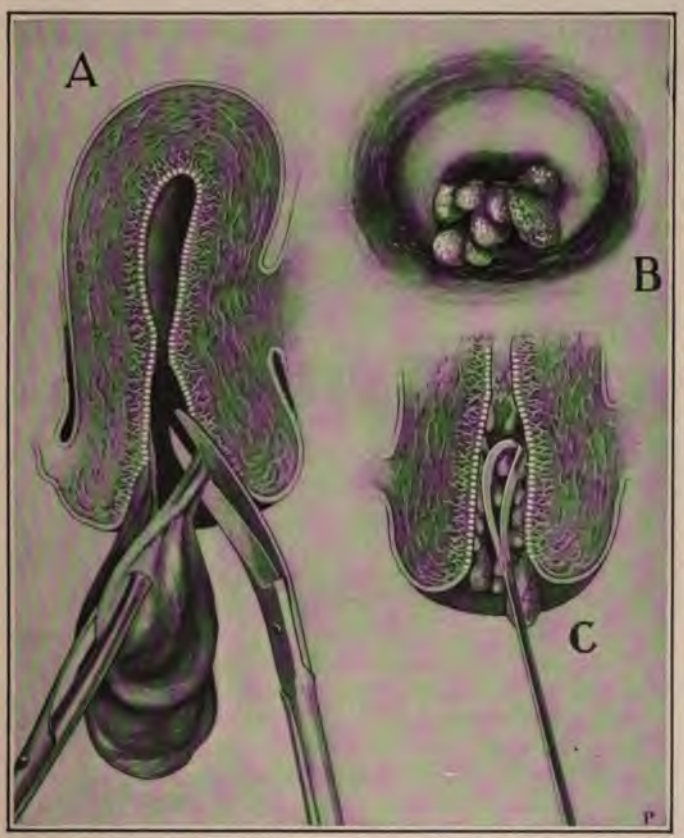
Symptoms.—The symptoms of both erosions and eversions are practically the same, that is, leucorrhœa and blood-stained vaginal discharge after any irritation of the area. In eversion or ectropion there is frequently added the other symptoms due to the laceration of the cervix. In many cases where erosions occur the cervix is increased in size, due to hypertrophy of the cervical connective tissue. There may be likewise an increase in the number and size of the cervical glands. On inspection the mucosa around the external os is a deeper red in color and the surface looks raised above the surrounding cervical mucosa. The area may look rough and small papillary outgrowths be seen. To touch, the erosion has a soft velvety feel from the thickened mucous membrane.

Treatment.—The treatment consists in the application of silver nitrate, tincture of iodine or similar substances, followed by the use of boroglycerid tampons. The daily use of an astringent and mildly antiseptic douche is to be advised.

CERVICAL CATARRH, NABOTHIAN FOLLICLES, CERVICAL POLYPUS.

Following inflammatory processes in the cervix, and as a result of erosions, or of the conditions which cause hyperplasia and hypertrophy of the mucosa of the corpus, one rather frequently finds a dilatation and increase in number of the cervical glands. There is frequently an

FIG. 182



A, mucous polypi of the cervix uteri—follicular hypertrophy. One polypus has been seized with forceps and is being removed with scissors; *B*, small mucous polypi hanging out of the cervix uteri. *C*, mucous polypi being removed from the cervical canal with the sharp curette. (Dudley.)

increase in the connective tissue, so that there is occlusion of the mouths of these glands and the formation of retention cysts (the Nabothian follicles). These are cervical glands filled with mucus. The same condition leads, at times, to the formation of cervical polypi.

Cervical polypi are made up of all of the constituents of the cervical mucous membrane—that is, connective tissue, epithelium, glands, and

bloodvessels. At times one, and again another, of these elements predominates, and consequently we may find the polypus firm with little tendency to bleed when the connective tissue predominates, or soft and easily broken down when the glands are in excess. In cavernous polypi there is an increased blood supply and their structure resembles in many respects the angiomata.

Diagnosis.—The diagnosis is of importance, as it may become necessary to distinguish these benign tumors from malignant growths of the cervix. The polypus springs from the cervical canal and protrudes from the external os. Its pedicle is slender and the protruding portion is red in color, resembling a cock's comb. It is usually very fragile and bleeds readily on manipulation. At times its color is very dark due to necrosis.

FIG. 183

Longitudinal section of the cervical mucous polypi.

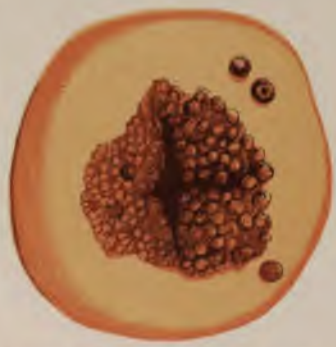
Symptoms.—The symptoms are not marked, as a rule, although hemorrhage may be rather profuse. Hemorrhage and leucorrhœa are the two chief symptoms, the former occurring as a blood-stained vaginal discharge or bleeding after sexual intercourse or douching, while the latter is largely made up of mucus.

Treatment.—The treatment consists in enucleation. This can be usually effected by twisting off the pedicle close to its attachment to the cervix. It is usually advisable to curette the uterus at the time the polypus is removed.

In cervical catarrh and Nabothian follicles there is an increased mucous discharge. An occasional douche and general tonic treatment are, as a rule, the only measures indicated. Application to the cervical canal of tincture of iodine, silver nitrate, and similar remedies are indicated. Curettage and incision of the dilated glands are at times necessary.

PLATE XX.

Granular Erosion of Cervix.



Cystic Degeneration after Laceration.

Deep Stellate Laceration.

Stellate Laceration with Ectropium and Cystic Disease.

Crescentic Laceration with Erosion of One Lip.

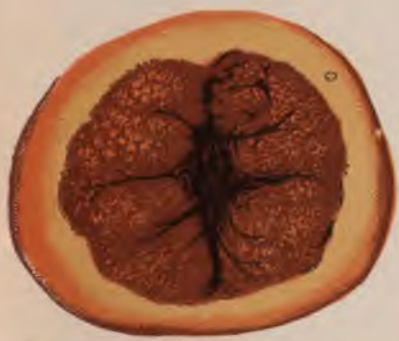
Deep Destructive Laceration up to Inner Os.

LACERATIONS OF CERVIX. (Mundé.)

PLATE XXI.

Unilateral Laceration beyond Vaginal Insertion.

Stellate Fissure with Erosion.



Double Laceration with Erosion.

Double Laceration beyond Vaginal Junction.

Bilateral Laceration, Great Erosion, and Cicatricial Induration Simulating Malignant Disease.

Cystic Disease Implanted on Lacerated Cervix Simulating Epithelioma.

Lacerations of Cervix. (Mundé.)

CHAPTER XII.

LACERATIONS OF THE CERVIX—SUBINVOLUTION AND HYPERINVOLUTION OF THE UTERUS.

By G. BROWN MILLER, M.D.

LACERATIONS OF THE CERVIX.

Laceration of the cervix is met with probably oftener than any other gynecological disturbance. It seems to be to some extent at least an almost constant sequence of labor and a not infrequent result of delivery at the earlier periods of pregnancy. In a large number of cases, however, the laceration is not of sufficient severity to demand treatment. Emmet, to whom is due the credit of calling attention to the importance of this lesion, probably overestimated its importance when he claimed that one-half of the uterine affections after the first pregnancy were due to a laceration of the cervix. Paller estimated that 40 per cent. of cervices are lacerated by labor; Goodell put them at 16 per cent.; Mundé said that 25 per cent. were lacerated after labor, but only 11 per cent. sufficiently to cause symptoms.

Etiology.—The cause of laceration of the cervix in the vast majority of cases is parturition. A normal delivery at term may not be accompanied by a laceration of the cervix, but it is very frequently. If the os is rigid and does not easily dilate with the labor pains on account of excess of connective tissue in the cervix, premature rupture of the membranes, an unusual presentation; if for any reason the cervix needs to be forcibly dilated; if it is necessary to do a version or to apply the forceps within the uterus, or even if the cervix does dilate and its anterior lip is incarcerated behind the pubes; if the uterine contractions are very strong, forcing the cervix to dilate unusually rapidly; if for any reason the dilatation of the cervix progresses more slowly than the advance of the head demands there must be a laceration of the cervix. If the uterus is emptied before term a tear may follow. Pozzi gives one case where laceration occurred even at the second month of pregnancy. Laceration of the cervix in delivery before term is especially liable to occur if the progress of the pregnancy has been mechanically interfered with.

In a certain number of cases lacerations of the cervix may follow operative procedures on the non-pregnant uterus, as in instances where polypi or submucous fibroids have been removed through the cervix, or where the cervix has been split to remove some other otherwise inaccessible growth in the interior of the uterus. So, too, operations on the cervix for stenosis of the os or conical elongated cervix, or for anteflexion of the uterus, leave scars that are practically lacerations of the

cervix. Again, in a certain number of cases of rigid os during labor, incisions of the cervix have been recommended to avoid lacerations, and the resulting scar is practically that of a laceration.

Degree.—A large number of the lacerations of the cervix are only slight, and as they heal leave a slit-like os externum that is characteristic

FIG. 184

Bilateral laceration of cervix.

of the uterus that has borne children and distinct from the small circular os of the nulliparous uterus.

Many of the lacerations of the cervix (those that make up the majority of the cases of simple laceration) are extensive enough to leave a distinct scar in the cervix. Such tears are most frequently on the sides of the

FIG. 185

Stellate laceration of cervix.

cervix, leaving as they heal a bilateral scar (Fig. 184). Tears on one side, more often the left (possibly from the frequency of the left occiput anterior position of the fetus), leave a unilateral scar. Less often the tears in the cervix are in several directions, leaving a scar of a stellate character. A few of the lacerations involve only the submucous tissues,

and while leaving no superficial scar, they may be found on examining the cervical canal. In this second class of extensive lacerations there is very frequently developed an eversion of the mucosa lining the cervical canal and changes in the cervix due to this exposure of the epithelium of the canal to the conditions of the vagina. Moreover, the scar by contracting down on the glands, nerves, and bloodvessels of the cervix produces changes in the cervix leading to subinvolution, cystic and papillomatous degeneration (Fig. 185).

Lacerations of the cervix that extend into the vagina are naturally still more serious, not merely from the greater extent of the laceration, but from the additional complications. A tear on either side of the uterus extending into the broad ligament opens up the cellular tissue so that infection may lead to a broad ligament abscess or pelvic cellulitis and their consequences. Even if no abscess develops the cicatrices tend to produce pelvic adhesions and displacements. If the laceration extends forward instead of laterally the possibility of a vesicouterine fistula arises; and posteriorly the rectouterine fistula may be formed, though both of these latter forms are very rare from the infrequency of the anterior and posterior lacerations. A few instances have been recorded where the entire vaginal portion of the cervix has been torn off from the rest of the uterus as a ring (evulsion of the cervix).

Pathology.—In the recent state the examination of the tissue of the cervix shows the swollen œdematous cervix softened by the congestion of the pregnancy and the labor, and the torn edges of the laceration which are considerably obscured by the œdema, so that the exact limits of the tear are much more difficult to define than in ordinary cutaneous or even mucous lacerations. Even the exact limits of the cervix itself are not clearly marked out immediately after labor when the laceration is fresh. Going hand in hand there set in the processes of involution of the whole parturient canal and the inflammation and repair of the cervical laceration, so that by the end of the first week after labor the cervix is much more clearly defined and the edges of the laceration much more distinct and at the same time very much less extensive. As involution and repair proceed the slight lacerations heal and leave merely the changed shape of the os externum to show the existence of the previous laceration. In the extensive lacerations the process of repair interferes with involution and there persists a subinvolution of the cervix at least, the involution seeming to go on more in the outer layers of the cervix, leaving the canal portion where the tear occurred in a state of less perfect involution and, hence, with an eversion of its mucosa into the vagina. As the result of this eversion the cylindrical epithelium of the cervical canal may be found growing out over the squamous epithelium of the vaginal portion of the cervix and replacing it. With this outgrowth there comes a blocking of the orifices of the mucous glands forming the cysts of the cystic degeneration or an hypertrophy of the squamous epithelium into papillomata. There is also an involvement in the scar tissues of the ends of nerves and subsequent pains. The eversion may go on to such an extent that the split cervix

assumes the appearance of the butt end of a celery stalk that has been split. In addition to these changes in the cervix itself are the associated changes in the neighboring tissues due to the extension of the laceration; for instance, into the broad ligaments, the broad ligament abscess, cellulitis, perimetritis, in the early stages, and later the adhesions between the cervix and the vaginal fornices, the uterine displacements, especially laterally, and the pelvic adhesions.

Symptoms.—At the time of the infliction of the laceration the symptoms of the laceration are usually overshadowed by those of the labor. The slight lacerations give practically no symptoms, either at the time of occurrence or later, and are discovered only by their appearance on examination for some other reason. In the extensive lacerations there may be sufficient bleeding which is not controlled by the usual methods applied to the control of uterine hemorrhage, to call attention to this additional source, and examination shows the laceration and the bleeding point. The late symptoms of the laceration are not characteristic. Pozzi describes a combination of symptoms which he calls a "uterine syndrome," which is found with laceration of the cervix as with all, or most, of the uterine disorders. The syndrome consists of the leucorrhœa, dysmenorrhœa, metrorrhagia, sterility and abortion; a pelvic pain as of a weight or foreign body carried in the pelvis, sacral pains of a dull, aching character, symptoms of the neighboring pelvic organs, symptoms referred to the distant organs, such as the digestive system, and those due to the central nervous system.

In opposition to Emmet's view of the importance of lacerations of the cervix Noeggerath[1] gave statistics showing:

1. That women with lacerated cervices conceive more easily and abort less frequently than others.
2. That the position of the uterus is not affected by lacerations of the cervix.
3. That the axis of the uterus is not elongated.
4. That erosions and ulcerations are not more frequent.
5. That ectropion is never a result.
6. That alteration of the cervical tissues is not more frequent.
7. That laceration has no effect on the frequency or the intensity of uterine disease.

The following year Brooks H. Wells[2] gave statistics refuting Noeggerath point for point. This article was written under Mundé's direction as Emmet's champion, and the importance of lacerations of the cervix and the appearance of reflex neuroses were insisted upon.

Examination.—Upon making a digital examination of the cervix immediately after the occurrence of the laceration, it is practically impossible to locate the laceration on account of the œdematous condition of the entire parturient canal. If, however, the labia are separated and the cervix inspected the raw edges of the laceration can be usually seen

[1] Berl. klin. Woch., 1887, No. 41.
[2] American Journal of Obstetrics, March, 1888, p. 257.

without difficulty, and if the lips of the cervix be drawn down with tenacula the extent of the lesion can be made out clearly.

More often, however, the lacerated cervix is not detected at the time of labor, but is found at some later time when the woman presents herself for treatment of some indefinite pelvic lesion. In these late cases the examining finger, instead of finding a small, round, or elliptical external os, as in the nullipara, detects a transverse slit extending perhaps all the way across the cervix; or if the laceration has been a stellate one the cervix, instead of appearing to consist of an anterior and a posterior lip, feels as though it were made up of several nodules. The examining finger also notes that the immediate vicinity of the cervical canal has a softer, more velvety surface than the peripheral portions. The multiple small cysts of cystic degeneration may be felt like shot embedded in the cervix. The excessive discharge in the vagina is also noted. The large size and soft consistency of the subinvoluted uterus, its displacement and adhesions are also felt. When the speculum is introduced into the vagina and the cervix inspected the shape of the external os is seen, the exact position of the lacerations, the eversion of the lips of the cervix exposing the epithelium of the canal, which has a darker red color than the vaginal epithelium; the cysts are seen. Tenacula inserted into the lips of the everted cervix make more evident the extent of the laceration as they bring the torn edges together.

In the lacerations that involve the vagina as well as the cervix to the above symptoms and signs are added in the recent state a greater hemorrhage, and possibly an escape of urine if either bladder or ureter has been injured; later, the symptoms and signs of broad ligament abscess, cellulitis, or sepsis may be found.

In the old cases the displacements of the uterus, the adhesions between the cervix and the vaginal walls, and the pelvic adhesions are all found on examination, even if they do not give characteristic symptoms.

Diagnosis.—The diagnosis of laceration of the cervix is based on the history of delivery followed by the symptoms of pelvic disturbance and the examination which shows the laceration, eversion, and associated lesions. In some cases there may be a history of some operative cause for the laceration, either an operative interference with the labor or some previous operation. In these cases the lacerations are more often in the anterior or posterior lines rather than in the lateral portions of the cervix. A condition of endocervicitis may be mistaken temporarily for a laceration of the cervix on account of the cervical discharge and eversion of the epithelium of the canal. In fact, eversion of the epithelium of the canal from any cause may very closely simulate a laceration of the cervix. Emmet describes a case which on examination showed an extensive cellulitis behind the uterus and to the left. The cervix was very large in proportion to the size of the uterus, and had the characteristic feel of laceration of the cervix. The examination with a speculum showed an eversion of the mucous membrane of the cervical canal apparently to the internal os. The condition yielded rapidly to

treatment, the everted surfaces rolled in again and in three months left a virgin os. The pelvic inflammation had evidently been the cause of the eversion of the epithelium of the cervical canal.

Treatment.—To prevent laceration of the cervix during labor there is little we can do, in the ordinary cases nothing except to avoid premature rupture of the membranes and so give the cervix every chance to dilate. In the cases of artificial dilatation of the cervix, dilatation with bags, especially the Champêtière de Rives type, is less liable to injure the cervix than instrumental or digital dilatation. In cases of tedious labor due to rigidity of the cervix, lacerations may perhaps be avoided by easing the pains temporarily by the use of chloral or morphine, or even in some instances chloroform. Incision of the rigid os may define the point of laceration and possibly limit its extent, but its use has been much more slowly adopted in America than in Europe. In the cases of precipitate labor there is usually no time for any treatment to save the cervix, but in the less rapid cases chloroform can be tried. In the instances where the anterior lip of the cervix is incarcerated behind the symphysis pubes it may be replaced.

The value of immediate repair of the laceration has been greatly questioned. If there is hemorrhage from the cervical tear that is not controlled by the usual methods it is advisable to take a sufficient number of stitches to control the bleeding. The arguments against immediate repair of the cervix lacerations are that lacerations which appear extensive in the œdematous cervix in many cases heal of themselves in the process of involution, making repair unnecessary; and also that as involution goes on and the tissues of the cervix become of less volume the stitches which have been put in immediately after labor become loose and do not hold the edges in apposition. Again, the presence of the lochia which must bathe the lacerated surfaces for at least a week after labor tends to interfere with primary union unless the cases are cared for in the most aseptic manner.

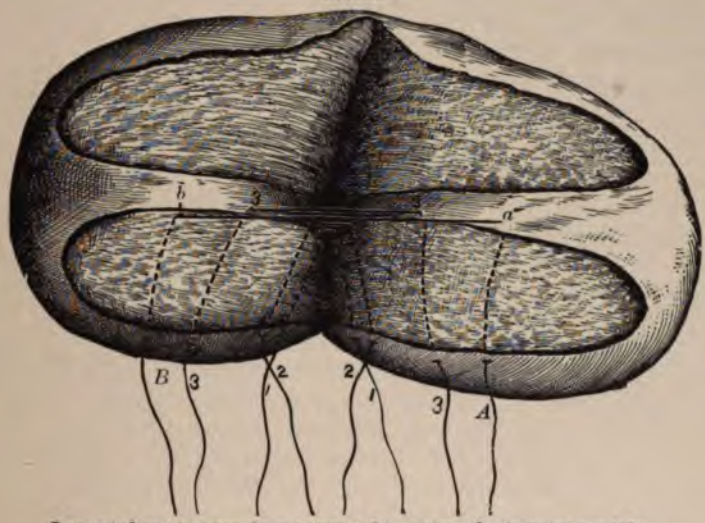
At the meeting of the American Gynecological Society in Boston, May, 1904, Davis cited 53 cases in his own practice where immediate repair of the cervix had been made. In 45 there was good union, in 6 fair union, and in 7 no union. None of the cases had been infected. He, however, did not advise immediate repair except by obstetricians who did their work with surgical asepsis. Dickinson advised repair on the fifth day postpartum, for at that time shrinkage of the cervix had occurred sufficiently so that the stitches did not become loose by the process of involution. He considered immediate repair indicated in the case of bleeding and after cervical incisions, and contraindicated by exhaustion due to labor and extensive injuries.

The majority of cases come for treatment, however, after the end of the puerperium, and often after months or years. In these late cases the associated lesions have developed considerable importance and need treatment before the laceration itself is repaired. The pelvic cellulitis should be treated by douches and boroglyceride tampons; the malposition corrected if possible with a pessary; the subinvolution of both cervix

and uterus by rest in bed and hot vaginal douches. The cystic glands should be punctured, the endocervicitis treated by applications of tincture of iodine, or tannin and glycerine tampons. Often the operative treatment may be avoided by thorough preparatory treatment, all of the symptoms disappearing, the eversion and the associated lesions clearing up and leaving merely a laceration that in itself does not warrant operation.

The indications for operation are the persistence of the symptoms after the preparatory treatment has been thoroughly carried out. Another argument in favor of the repair of extensive lacerations is the frequency of the occurrence of cancer of the cervix in multipara, and, therefore, associated with lacerations of the cervix.

FIG. 186



Lacerated cervix after denudation and insertion of sutures on one side.

The contraindications to repair of the lacerations of the cervix are the acute inflammatory lesions in the pelvis which are liable to be spread by the manipulations of the uterus necessary for the operation. The possibility of future lacerations following the repair of the existing ones is very slight if the operation is properly done, care being taken to leave a sufficient cervical canal (Fig. 186).

The operation for the repair of the laceration of the cervix, trachelorrhaphy, is commonly known as Emmet's operation. It is described for the most common form of laceration, the bilateral, but is equally applicable on a single side to the unilateral, and also in stellate lacerations where the additional scars are not too deep. The patient is put in the lithotomy position, or if the operator prefers in the Sims position, and prepared in the usual aseptic way. A preliminary curettage is usually desirable as treatment of the associated endometritis and endocervicitis. The cervix is exposed with anterior and posterior specula,

A tenaculum or a fixation forceps of some kind is inserted into either lip of the cervix and the uterus pulled down as near as practicable to the vaginal outlet. The two lips of the cervix are then approximated and adjusted to determine what is to be the extent of denudation necessary to repair the laceration. In doing this the fixation forceps should be reinserted to occupy the part that is not to be denuded but left to line the cervical canal. Then, with a scalpel or a pair of strong, sharp-pointed scissors the mucous membrane is marked out and denuded in both anterior and posterior lips and the fibrous scar tissue in the angle between the two lips excised on either side of the part left for the cervical canal. It is very essential that the plug of scar tissue in the angle between the two lips be removed in order not to interfere with the nutrition of the lips when they are brought together. When the denudation has been completed the sutures are put in. Strong, sharply curved needles with bayonet points are most convenient. Silkworm-gut is probably most frequently applicable, though some prefer silver wire. Both of these have the disadvantage that in cases where the perineum is lacerated and is repaired at the same time as the cervix that the perineum may be disturbed in removing the cervix sutures. In such cases the cervix sutures are left in for two or three months until the perineum is firmly united. To avoid the removal of cervix sutures, kangaroo tendon or catgut, either chromicized or plain, may be used, but heavy gut must be used. The sutures are inserted, as a rule, three or four on each side and all inserted before any are tied. The suture is passed through the posterior lip from the edge of the vaginal epithelium to the margin of the epithelium left for the cervical canal; then through the anterior lip from the margin of the epithelium for the cervical canal to the vaginal portion so that when the ligature is tied the knot will lie in the vagina. The suture in the angle is passed first and that nearest what is to be the external os passed last. When all of the sutures have been inserted they are tied in the order in which they were inserted. If silver wire is used of course it is twisted instead of tied. And if silkworm-gut is used it may be clamped with shot instead of being tied. The shot aid in identifying the point at which the suture is to be cut at the time of removal. After the sutures have all been tied they should be cut off, leaving the ends at least an inch long to identify them at the time of removal. A piece of gauze drainage is inserted into the cervical canal if the operator has any question as to its patency, or if for any reason it is desired to be especially careful of uterine drainage. Another gauze drain is introduced into the vagina, a vulval pad applied, and held in place by a T-bandage for the perineum. About forty-eight hours after the operation the vaginal and cervical gauze should be removed, and if there is any discharge a vaginal douche given. If the operation on the cervix has been done without any suture of the perineum the sutures may be removed at the end of two to four weeks. To do this the patient should be again put on the operating table in the position for operation or in the knee-chest position, but without an anæsthetic, specula introduced and the sutures removed with the usual care. As it is not always

easy to identify the sutures if they are embedded in the tissues, good light is necessary and the advantages of the shot and the long ends of the sutures will be readily seen. Absorbable catgut sutures, of course, do not need removal. If the perineum has been sutured at the same time as the cervix the removal of the sutures should be postponed until from eight to twelve weeks. Even in the simple cases of suture of the cervix some forbid coitus for three months after the operation.

In many instances of stellate lacerations trachelorrhaphy is not satisfactory and then an amputation of the cervix is indicated. In general it is said that when one is in doubt whether to attempt to repair a laceration or to amputate one should amputate. Hegar's amputation is the form most applicable to lacerations of the cervix with considerable scar tissue and a diseased condition of the epithelium of the canal. In this, with the patient in the same position as for trachelorrhaphy, a circular incision is made into the cervix just below the vaginal fornices. Then with the point of the scalpel directed toward the cervical canal a conical section is removed, the apex of the cone being in the cervical canal. The sutures are introduced from the vaginal epithelium through the substance of the cervix stump to the epithelium of the canal. These sutures are inserted first posteriorly and then anteriorly, and if there is a redundance of vaginal epithelium lateral sutures may be put in which do not penetrate the cervical canal but merely bring the two edges of the vaginal portion into apposition. If lateral sutures can be introduced so as to have them all penetrate the canal the result is neater.

Another method of amputation of the cervix is also in common use, a two-flap method described by Schroeder. In this form a transverse incision is made into the cervix, splitting it into anterior and posterior lips. This incision is carried somewhat deeper than the level at which the amputation is desired. Then a wedge of tissue is removed from each lip, extending all the way across the lip. This wedge is removed by making first an incision with a scalpel into the lip of the cervix from the canal side perpendicular to the canal; then another incision to meet this in the tissues of the cervix from the vaginal side. Sutures are then introduced in the middle of the anterior and posterior lips, going from the vaginal surface through the cervical tissues into the canal. When the canal has been assured the corners of the flaps on the sides may be cut off sufficiently to allow approximation of the epithelial edges on the vaginal surface. The after-treatment of the cases where amputation has been done in place of trachelorrhaphy is the same as for the less extensive cases. The advantages of amputation over trachelorrhaphy, for which some gynecologists urge amputation always in place of trachelorrhaphy, are the complete removal of all of the diseased tissues from the cervical canal. It does not interfere with conception, the course of pregnancy, or labor. If diseased tissue would be left behind by a trachelorrhaphy it certainly is preferable to do an amputation of the cervix. But an amputation would scarcely seem necessary in every instance.

SUBINVOLUTION.

Involution.—After the emptying of the pregnant uterus, whether at the end or during the course of pregnancy, the uterus tends to return to approximately its previous non-pregnant condition by the atrophy of the tissues that have been hypertrophied during the course of the pregnancy. This atrophy is physiological and dependent upon the decreased supply of blood needed by the uterus. It is called involution. After labor at term this process proceeds at such a rate that usually the uterus, which immediately after delivery rises so high that its fundus is half-way up between the symphysis pubis and the umbilicus, has decreased by the tenth day so that the fundus is about on the level of the upper margin of the symphysis and can just be felt by abdominal palpation. From that time on the decrease is at a slower rate, returning in six to ten weeks after labor to about its normal size, with a cavity measuring 6.5 to 7 cm. in length. Hansen[1] gives the following table of measurements of the length of the uterine cavity during the process of involution:

Time.	Number of cases.	Measurements.		
		Average.	Minimum.	Maximum.
10 days	114	10.6 cm.	8.0 cm.	13.5 cm.
15 "	119	9.9 "	8.3 "	11.5 "
3 weeks	95	8.8 "	7.2 "	10.5 "
4 "	80	8.0 "	7.0 "	9.3 "
5 "	64	7.5 "	6.5 "	9.0 "
6 "	56	7.1 "	6.2 "	9.1 "
7 "	40	6.9 "	6.0 "	8.5 "
8 "	31	6.7 "	5.6 "	8.5 "
10 "	22	6.5 "	5.4 "	7.5 "
12 "	15	6.5 "	6.0 "	7.5 "

In this process of involution the changes that take place are largely those of hypoplasia, a decrease in size of the tissues in the organ. The muscle cells return to the size that they were at the beginning of the pregnancy and probably some of them undergo a fatty degeneration and disappear to compensate for the new cells that were formed. The bloodvessels contract and their walls undergo a compensatory endarteritis with certain hyaline changes. So, too, the lymphatics and nerves return again to their previous dimensions.

The process of involution also involves all of the other tissues that have been hypertrophied to do the work called for by the pregnancy; the vagina, the adnexa, and even the more remotely connected organs, such as the heart.

Subinvolution. Definition.—Instead of this process of involution going on in its normal way, in a certain number of instances it is interfered with and after having advanced to a certain point it ceases and the uterus remains unduly large. The rate of involution in these cases is also slower than normal. This condition of partial involution we call subinvolution.

[1] Medical Record, Oct. 6, 1888.

Etiology.—In general the cause of subinvolution is some condition which by demanding a greater blood supply in the uterus interferes with the physiological decrease in that blood supply. Such causes are, in the vast majority of instances, of local origin. We find them frequently in the instances where the mothers from some cause or other do not nurse their infants. Here we may find a twofold influence at work: first, the fact that the blood is not needed for the development of the breasts and their secretion allows of its distribution to other parts of the body, and the uterus claims a share which it would not have had if the breasts had been active and demanding a rich blood supply; second, the intimate nervous connection between the breasts and the uterus may have some influence regulating the comparative blood supply of the two organs.

Of the local conditions leading to subinvolution by demanding more than a normal blood supply to the uterus during this puerperal period are: the intrauterine conditions such as the retention of portions of the placenta or membranes whether sterile or undergoing saprogenic changes, retention of blood clots, fibrinous polypi, and infection of the endometrium. In the uterine conditions we find displacements, fibroids, and lacerations of the cervix causing persistence of the excessive blood supply. In the periuterine conditions, inflammatory pelvic conditions and adhesions are of the most importance. Chronic constipation and retention of urine for long periods are also causative factors in the persistence of the congestion of the uterus. So, too, is premature coitus and sexual excitement.

Of the general conditions prolonging the congestion of the uterus one of the most common is the filling of the pelvic vessels caused by too early rising from childbed; especially is this significant after miscarriages when the woman thinks that because the pregnancy has not gone to term she may be relieved from staying in bed sooner than after labor. Systemic conditions, which, under all circumstances lead to general circulatory disturbances, are also in some cases important factors. Here are placed the conditions of heart disease, lung troubles that interfere with the freedom of the pulmonary circulation, nephritis, and cirrhosis of the liver. Abdominal tumors that interfere with the pelvic circulation have a similar effect. The nervous influence of mental shock may also decrease the rate of involution.

Pathology.—The pathological examination of cases of subinvolution shows (1) the abnormal conditions of the cause, such as the systemic condition producing general congestion, the periuterine inflammation, uterine displacement, neoplasms of the uterus, laceration of the cervix, intrauterine debris from the pregnancy, or endometritis; (2) the conditions due to the associated subinvolution of the vagina and adnexa; and (3) the subinvolution of the uterus itself, shown in the uniformly enlarged, doughy, congested uterus, the thickened walls, the thickening being partly in the mucosa and partly in the muscular layer, the blood-vessels prominent on section. On microscopic examination of the uterine wall the cells of the muscle layer are seen to have undergone partial

atrophy since their condition during pregnancy, but not to have assumed completely the size that they had before the pregnancy. Williams gives the size of the muscle fibres in the non-pregnant uterus as 0.005 by 0.05 to 0.07 mm., and those of pregnant uterus as 0.009 to 0.014 by 0.2 to 0.52 mm.; that is, two to seven times wider and from seven to eleven times longer than in the non-pregnant uterus. The mucosa shows also more or less congestion and thickening due to glandular hypertrophy. If the condition has persisted for some time a true fibrous transformation is evident.

Symptoms.—The symptoms of the cause may be so marked as to obscure those of the subinvolution. The symptoms of subinvolution of which the patient complains are scarcely characteristic. The return from labor to normal health is slow. There is more or less malaise and indefinite pelvic pains of a dull, aching character. There is a sense of weight in the pelvis and there are aching pains in the lumbosacral region. The lochia persists unusually long and contains traces of blood longer than usual. It is followed by a more or less persistent leucorrhœa. The menses when they reappear are often profuse and may come at irregular intervals, usually too frequent.

The general examination of the patient may show lesions of the heart, lungs, kidneys, or liver, or abdominal conditions tending to produce a passive pelvic congestion.

The pelvic examination shows the persistent lochia or the leucorrhœa, the signs of the previous pregnancy, and a uterus that is uniformly enlarged, not so firm as normal, not painful except on account of some complication. The position of the uterus is frequently retroversion, possibly in a few instances anteversion. The signs of the causative and local factors: lacerations of the cervix, fibroids, or periuterine inflammation may be elicited. A sound passed into the uterus shows beyond doubt its greater length than the normal 7 cm.

Prognosis.—If the subinvolution remains untreated there will probably develop a chronic metritis and endometritis, with excessive menstruation and leucorrhœa. Displacements, perhaps progressing to prolapse, are very likely to follow; subsequent pregnancies are very liable to end in miscarriages, the aching dull pains and the depressed health will persist; and marked nervous disturbances of the melancholic type have been attributed to the persistent subinvolution.

If the subinvolution is treated and is due to some cause which can be removed or remedied the prognosis for complete recovery is exceedingly favorable, and such include the greater number of the cases. If, however, the subinvolution is due to some cause which cannot be removed the result will be in proportion, of course, to the degree of improvement to which the cause is susceptible.

Treatment.—The prevention of subinvolution lies in the care of the woman during the course of the labor and the puerperium, the careful removal of the secundines, the maintenance of asepsis, the prompt repair of lacerations, the maintaining of the horizontal position of the body until involution is well advanced and the careful regulation of the bowels,

If subinvolution has occurred, the treatment should be directed primarily to the cause of the retarded involution. Secundines or diseased endometrium should be thoroughly removed with a curette, displacements of the uterus should be corrected, lacerations of the cervix should be sewed up, fibroids removed, periuterine inflammations should be treated with appropriate hot douches or medicated tampons. General treatment for the cases of passive congestion due to disease of the other organs, heart, lungs, liver, kidneys, etc., should be given. In addition to these lines of treatment of the cause of the subinvolution, tonics, such as strychnine and quinine, will aid in the restoration of the tone of the uterine tissues. The continued use of ergot several times a day may be of benefit. Direct stimulation of the uterine contractions by the faradic current may also tend to decrease the congestion, and hot douches in addition to their effect upon any periuterine inflammation may also act on the condition in the uterus itself. A great deal can be gained by merely keeping the patient on her back in bed, but, as a rule, the patients do not feel sick enough to give up so much of their customary life.

Hyperinvolution, Lactation Atrophy.—In certain other cases involution instead of being arrested before the uterus has returned to its previous dimensions goes on beyond that point, reducing the uterus to a much greater extent. There has been described a case where the uterine cavity measured but half an inch in length. There seems to be a more or less physiological hyperinvolution during the period when the mother is nursing her infant, which has been described as lactation atrophy; this condition, as a rule, is but a temporary one, disappearing when the infant is weaned or possibly before that if the nursing is continued for a considerable period. But in addition to this lactation atrophy there is also a pathological condition where the uterus, instead of recovering its normal size and functions after weaning, remains atrophic, and if the menses return they are usually associated with considerable pain and are scantier than before. Sterility is frequently a sequel of this pathological atrophy. The prognosis in these cases is not encouraging, most of them continuing in spite of treatment. Stimulation of the uterus by electricity, hot douches, massage, etc., are of but little avail, and constitutional treatment with tonics seems to be equally inefficacious. The menopause comes on prematurely and brings with it at least a relief from the pains that accompany the menses since the hyperinvolution began. At times it may be advisable even to do an ovariotomy to hasten this termination and escape the pains of the menses.

CHAPTER XIII.

INVERSION OF THE UTERUS.

By G. BROWN MILLER, M.D.

By inversion of the uterus is meant that condition of this organ in which the mucous membrane forms a convexity downward, while the serous membrane forms a corresponding depression above. The condition may affect only a small part of the uterus, a larger portion of it, or involve the entire organ. The two former conditions are called *incomplete inversion*, while the latter is termed *complete inversion*. In incomplete inversion no portion of the inverted organ may protrude from the cervical canal and the condition is represented by a convexity of the mucosa into the uterine cavity with a depression of the peritoneal

Fig. 187

Complete inversion of the uterus.

surface above. In more pronounced cases of incomplete inversion the inverted fundus may protrude through the cervical canal into the vagina, the cervix not being inverted. In complete inversion the whole of the uterus is turned inside out and the inverted organ lies in the vagina, or may protrude from the vulva and hang down between the thighs of the woman. As the inversion occurs the depressed portion above drags down with it the appendages, so that a portion or whole of the tubes and ovaries may lie in the cone-shaped depression, together with a portion of the round ligaments. In an acute inversion following labor one sees the ragged, raw, bleeding inner surface of the uterus, with at

times the placenta attached, lying in the vagina or entirely outside the vulva. If the inversion has gradually occurred, as generally happens when it is caused by submucous tumors, or if it has existed a considerable time, changes occur which are due to involution in puerperal cases and to stasis. Through involution the uterus may regain its normal size and the protruding portion become covered with mucous membrane. The involution affects also the cervix, which by its return to a size approaching normal tends to press upon the bloodvessels and to prevent a free return of venous blood. This stasis is also due to the compression

FIG. 188

Uterus completely inverted into vagina.

of the veins due directly to the inversion. As a result of the stasis there is œdema which may lead to hypertrophy. The mucous membrane, being exposed to mechanical insults from its position in the vagina or externally, may undergo loss of substance. Being deprived of the protection of the cervical canal, and at times of its epithelium, the uterus is liable to infection or to the action of saprophytic bacteria, so that we frequently find inflammatory conditions present. Necrosis may result from pressure on the uterine bloodvessels. In case the bacteria have penetrated into the peritoneal cavity, either directly through the uterine walls, or by way of the tubes, one finds localized peritonitis, salpingitis, etc., present.

FIG. 189

FIG. 190

FIG. 191

FIG. 189.—Partial inversion of the left horn of the uterus. (Dudley.)
FIG. 190.—Myoma simulating partial inversion at the left horn of the uterus. (Dudley.)
FIG. 191.—Partial inversion of the uterus complicated by and caused by a myoma. (Dudley.)

FIG. 192

FIG. 193

FIG. 194

FIG. 192.—Partial inversion of the uterus; the fundus is at the os externum. (Dudley.)
FIG. 193.—Pedunculated myoma protruding from the os externum, resembling an inverted fundu uteri. (Dudley.)
FIG. 194.—Slight inversion of the fundus uteri with pedunculated uterine myoma protrudi through the os externum and resembling inversion. (Dudley.)

FIG. 195

FIG. 196

FIG. 197

FIG. 195.—Complete inversion of the uterus complicated by a myoma in the perito which has all the physical appearance of a uterus. There is difficulty in such a case in which is the uterus and which is the myoma. (Dudley.)
FIG. 196.—The uterus is inverted completely into the vagina. (Dudley.)
FIG. 197.—The reverse of Fig. 195. (Dudley.)

Etiology.—Inversion may occur after labor or miscarriage, or be due to the expulsion of submucous tumors from the uterine cavity. The puerperal inversion occurs much more frequently than that due to tumors. In complete inversion the ratio is placed at 9 to 1. The occurrence of inversion is very rare. Beckmann states that in 250,000 labors in the St. Petersburg Lying-in Hospital not a single case of inversion occurred. Madden noted it but once in 190,833 labors in Dublin. I have seen 2 cases produced by submucous fibromyomata. In the puerperal inversion the condition is generally caused either by pulling in the cord or by ill-performed efforts at expulsion of the placenta while the uterus is in a relaxed condition. At times, however, it is due to a short cord or one which is shortened by being wrapped around the neck of the child. In rapid labors with a short cord the expulsion of the child pulls on the adherent placenta and can cause inversion. In other cases it seems to occur spontaneously.

In those cases due to tumors the latter are attached to the fundus and the contractions of the uterine muscle to expel the tumor forces the latter from the cervix and the wall of the attached uterus is dragged with it.

Symptoms.—The symptoms of inversion are pain, hemorrhage, vomiting, shock, the presence of a tumor in the vagina or between the thighs of the patient, anæmia, urinary symptoms, and frequently symptoms of sepsis, sapremia, and uremia.

At the time of the occurrence of the inversion the woman experiences severe pain in the lower part of the abdomen and pelvis. There is also a feeling of pressure and weight due to the presence of the uterus in the vagina and the dragging upon the pelvic ligaments. There is likely to be nausea and vomiting and symptoms of shock at the same time. Accompanying the inversion there is marked hemorrhage in puerperal cases. Where the condition is due to a tumor the hemorrhage has generally preceded the inversion for weeks or months, but is more marked at the time when the inversion occurs. In chronic cases there is a serous, mucoid discharge from the genitalia. This is frequently blood-stained. The woman is conscious of the presence of the inverted uterus and thinks she has a prolapsed uterus. Marked secondary anæmia is usually present. The changed relations between the uterus and bladder lead to frequent or difficult micturition and more or less pressure on the lower ends of the ureters. The pressure on the ureters doubtless leads, at times, to pathological lesions in the kidneys, although little or no mention is made of this by most writers. In one of my cases the woman had nephritis and died with the symptoms of uræmia. When infection occurs there are the symptoms of sepsis and one, at times, sees the vagina and mucous surface of the uterus bathed with a bloody, foul-smelling secretion due to the action of putrefactive bacteria.

Diagnosis.—The diagnosis of complete inversion can be readily made by careful examination. A tumor will be found lying in the vagina or outside the vulva and in passing the finger around the tumor no trace of the cervix will be found. The bimanual examination will show the absence of the uterus from the pelvis and in women with thin abdominal

walls a depression will be found in the usual site of the uterus. The same depression should be detected by a rectal examination. By careful inspection of the protruding tumor one can usually find the openings of the Fallopian tubes, which may be probed.

Where the fundus protrudes into the vagina and the cervix is not inverted a sound or the finger, if inserted past the fundus into the cervical canal, enters only a short distance (1 to 2 cm.), and the palpation through the abdominal walls will show the absence of the uterus from its usual situation. This condition may be readily mistaken for a submucous tumor which has been expelled from the uterine cavity, but the passage of the sound and the bimanual examination should make the diagnosis clear.

Where a small portion of the uterine wall is inverted and there is no protrusion from the cervix, or in those cases where a tumor has caused an incomplete inversion the diagnosis may be extremely difficult to make. In these cases also a careful palpation under an anæsthetic will, as a rule, show the true state of things. By the introduction of the finger into the uterine cavity one should be able to detect the protrusion downward, and when operating for the removal of submucous tumors we should always bear in mind the possibility of the existence of a partial inversion and take steps to avoid entering the peritoneal cavity.

The diagnosis may be considerably complicated by the presence of inflammatory conditions of the tubes, small tumors of the ovaries, and similar conditions, where the bimanual examination will give little that is valuable in the detection of the real disease.

Treatment.—There are many methods advocated in the treatment of inversion of the uterus. They may be divided into three classes: the non-operative reduction of inversion, the operative reduction, and the removal of the uterus or a portion of it. It is, of course, desirable to reduce the inversion, if possible, by taxis or pressure, and failing to accomplish it by this means, to reduce it by operative methods. In cases where there is necrosis infection, and in certain cases of fibroid tumors, it is not only easier but much safer to remove the uterus or amputate at the cervix.

The reduction of inversion by taxis or pressure should be successful in cases which are seen immediately after the accident occurs. After the cervix has contracted the method is likely to fail. The principles involved are the following: Equable compression of the fundus and upward pressure with one hand while counterpressure is made upon the inverted cervical ring above or fixing the cervix with tenaculum forceps. The pressure below should be applied so as to reverse the steps by which the uterus became inverted—*i. e.*, the inverted cervix should be reduced first, and this is followed by the adjoining portions of the fundus until the whole organ is reduced. The counterpressure is made upon the cervical ring above through the abdominal walls, or aided by two fingers in the rectum. The dilatation of the urethra so as to admit a finger to make pressure through the bladder has been also advocated.

The patient should be anæsthetized. After the reinversion has been accomplished ergot should be administered.

The various instruments which have been recommended for the reduction of inversion are generally both useless and dangerous, and the use of long-continued pressure by means of colpeurynters, iodoform gauze, tampons, etc., are to be discountenanced not only because they rarely accomplish the desired result but because their use means delay, and, in consequence, added dangers of infection and necrosis.

The best method of reduction of the inverted uterus by operation is the following, which is a modification of Küstner's operation: A transverse opening is made into Douglas' cul-de-sac, and with a finger as a guide the cervix is cut through by a longitudinal incision which extends to within 2 to 3 cm. of the fundus. The reinversion can be now easily effected, as a rule. The longitudinal incision in the uterus is sutured and a gauze drain placed in the cul-de-sac to guard against infection and to afford an exit for the oozing which may occur.

A similar incision has been made anteriorly, instead of in the posterior wall of the uterus, after separating the bladder. Spinelli split the anterior uterine wall from the external os to the fundus. After reinversion the uterine incision was closed and the uterus was held forward by fixation sutures. Peterson advocates this operation with the modification suggested by Taylor of removing a wedge-shaped piece of the uterine wall to allow the incision to be better closed. The uterus is held forward by suturing the uterine ends of the round ligaments to the incision in the vaginal wall. This method has the advantages of not producing an adherent retroversion which is likely to result from the other method, but the disadvantage in the liability of injury of the bladder. The relations of the cervix to the bladder are so changed that an injury to the latter structure is not unlikely to occur. In this method the uterus is sutured after reposition and a drain placed between the bladder and the uterus.

The reduction by means of laparotomy has not been very successful. It offers no advantage over the vaginal operation and has a larger percentage of failures and a greater mortality than the vaginal procedure.

In cases of inversion produced by submucous tumors the operation indicated will depend upon the age of the woman, and the condition of the uterus and tumor. In cases of comparatively young women where the tumor is a fibromyoma which can be readily enucleated the reduction may be accomplished after the removal of the tumor. In the majority of cases vaginal hysterectomy is indicated for the following reasons:

A certain percentage of the tumors causing inversion are sarcomata, the woman in these cases is usually at or past the menopause, the uterus is liable to be the seat of other tumors, and the tumor or uterus is likely to be infected. For the foregoing reasons the removal of the uterus is generally indicated.

Vaginal hysterectomy should be performed when there is infection or necrosis of the uterus, in cases of inversion due to a tumor in women past the menopause or where the presence of other tumors or the probability of malignancy would indicate the removal of the organ. It can be readily accomplished by bisection of the uterus and the subsequent enucleation of the halves of the bisected organ.

CHAPTER XIV.

FIBROMYOMATA OF THE UTERUS.

By G. BROWN MILLER, M.D.

ANATOMY, HISTOLOGY, SYMPTOMATOLOGY, DIAGNOSIS AND PROGNOSIS.

Anatomy.—The new-growth which occurs most frequently in the uterus is the fibromyoma. These growths are also called fibromata, myomata, or merely fibroids. The term *fibroid* would seem most acceptable of these shorter names, for while the tumors of this class probably originate as myomata, they undergo more or less complete fibromatous degeneration and later are mixed tumors usually with a preponderance of the fibrous tissue. These growths occur in 20 to 30 per cent. of all women reaching thirty-five years of age and are apparently found more frequently in the negro race than in the white. They are found most frequently in the years of sexual activity of the woman, being practically never seen before puberty nor appearing primarily after the menopause. The menopause is, however, often postponed in these cases until fifty or sixty years of age. They very rarely appear singly. Bland Sutton reported one case where there were 120 fibroids in a uterus measuring only 10 by 15 cm. in diameter. The size of these tumors may be very large, Hunter having reported a case where a fibroid weighing 140 pounds was removed at autopsy and the cadaver without the fibroid weighed but 95 pounds. Fibromyomata may occur in any part of the uterus, fundus, or cervix, but are much less frequently found in the cervix. They are found primarily in the myometrium and are then called interstitial or intramural. As they grow some tend to be extruded into the uterine cavity becoming *submucous*. The extrusion may go on until the fibroid becomes pedunculated in the cavity of the uterus (a polypus) or even until the polypus is entirely cast off. During this process, however, at times, adhesions to the vaginal walls may take place. Similarly, other masses tend to be extruded into the peritoneal cavity, becoming *subserous* fibroids. These likewise may become pedunculated and form adhesions to the adjacent peritoneal surfaces. The immense fibroids like the one reported by Hunter are usually nourished from the adhesions as well as from the primary pedicle from the uterus.

The interstitial tumors are naturally most common, numbering about 50 per cent. of all fibroids. They are usually enclosed in a capsule of less dense connective tissue, from which they can be easily shelled out. At times, however, they are not encapsulated, but are rather a diffuse mass, being softer and consisting of more muscle tissue than is usually

the case. The subserous tumors form about 30 per cent. of all fibromyomata. If they are composed of muscle fibres in great part their surface is smooth, while if the fibrous tissue predominates the surface is more uneven and lumpy. These subserous fibroids not infrequently are so far extruded from the walls of the uterus that they remain attached merely by a stalk or pedicle, and then this pedicle, which contains the

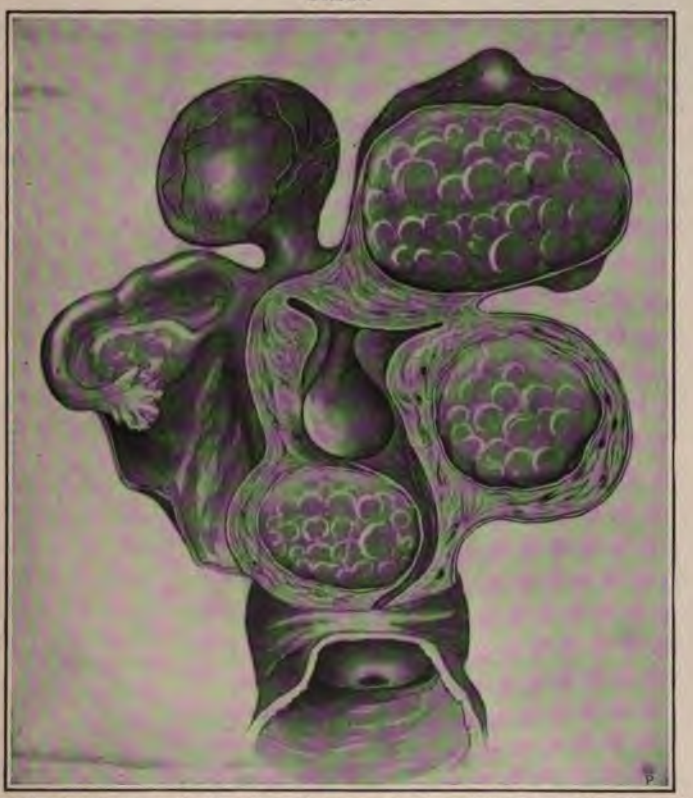
FIG. 198

Uterus with fibroid tumors. *IM*, intramural; *SM*, submucous with inflammatory injection of their bed and progressive enucleation and destruction. (Schroeder.)

bloodvessels supplying the nourishment of the tumor, may become twisted or kinked, cutting off the blood supply and causing thrombosis of these vessels (more often the veins than the arteries), infiltration of the fibroid with blood and setting up an inflammation in the tumor which may lead to peritonitis and adhesions or to necrosis of the strangulated tumor. Symptoms which indicate a twist of the pedicle not infrequently occur in attacks that recur at irregular intervals, usually with increasing frequency and severity.

The submucous fibromyomata are somewhat less common, numbering about 20 per cent. of the cases. These, like the subserous, may be either sessile or in their later development pedunculated. The pedunculated are called fibroid polyps. At first these polyps are spherical, but later they become pyriform, the stalk becomes thinner and tends to be reduced to merely mucous membrane and then to disappear, casting

FIG. 199

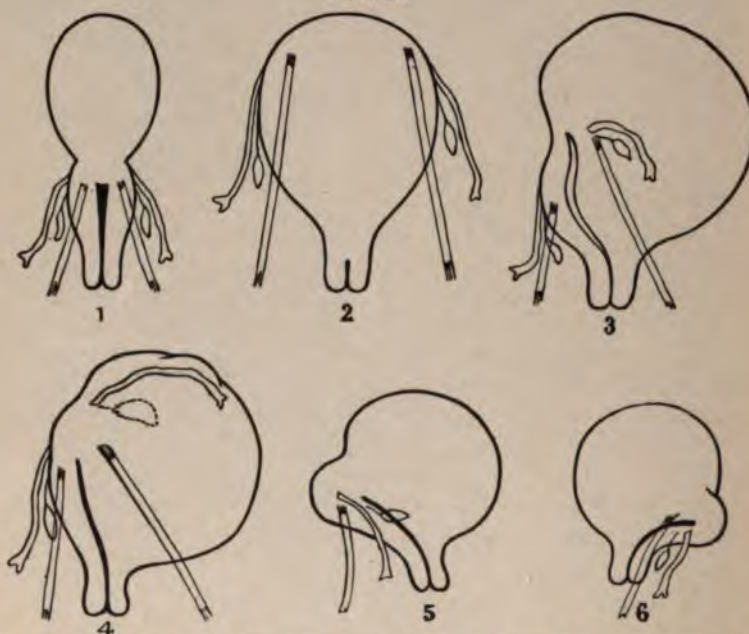


Intramural, submucous and subperitoneal myomata. A pedunculated subperitoneal myoma sometimes is called wrongly extrauterine myoma. A pedunculated submucous myoma is called intrauterine polypus. (Dudley.)

the fibroid off into the cavity of the uterus or the vagina. The submucous fibroids are usually soft and of proportionately rapid growth. In their early stages the blood supply is rich, and bleeding is frequent and often profuse, though in exceptional cases there may be no hemorrhage. Later, necrosis often occurs from diminution of the blood supply. The extrusion of a polyp is due not only to the growth of the fibroid but to the softening caused by the œdema and the mechanical contractions of the uterus. It is in this class that the hypertrophy of the uterine muscle is most marked and closely resembles the changes occurring in pregnancy.

The shape of the uterus is changed not merely by the presence of the tumor mass causing irregularities in the form of the uterus on its external surface, the shape of the uterine cavity, and the thickness of the uterine walls, but also by hypertrophy of the muscle tissue throughout the entire uterus. Especially is the hypertrophy of the muscle tissue marked in the interstitial and the submucous varieties where the tendency to extrusion by the uterine contractions is more marked than in the subserous variety. The general shape of the uterus is markedly changed, of course, in the instances where a fibroid polyp in its process

FIG. 200



Diagrams showing position of round ligaments in different types of fibroid tumors. 1. Subserous at fundus with no change in round ligaments. 2. Interstitial and submucous of fundus with symmetrical raising of round ligaments. 3. Subserous lateral raising one ovary and round ligament. 4. Similar deeper raising ovary but not round ligament, intraligamentous. 5. Posterior wall around ligaments and ovaries pushed forward. 6. Anterior wall around ligaments and ovaries pushed backward. (Winter.)

of extrusion has pulled the uterus after it and produced an inversion of the uterus, which is more or less complete.

Histology.—The peritoneal coat of the uterus is not changed by the presence of the fibroids except in its relations to the other pelvic organs —the portions of the bladder and rectum that are covered and the relations to the structures in the broad ligament.

The mucous membrane is stretched and atrophied over the mass of the tumor; and in the valleys between two tumors the mucosa is thickened and hypertrophied. The structure of the mucosa remains of the

same type as in the normal conditions, or may show the inflammatory changes due to a secondary endometritis.

The muscular layer of the uterus is the one where the great modifications take place. The cut section of the uterus through the fibroid shows the mass of the tumor to stand out above the level of the rest of the section. This is due to the firmness of the tissues of the tumor, the looseness of the capsule, and the elasticity of the other tissues. The muscle coat surrounding the tumor is seen to be thickened and to consist of the usual unstriped muscle cells which have undergone hypertrophy and hyperplasia similar to that of pregnancy. The tumor itself may consist of a single node or of many, in each of which there is a network of fibres arranged in groups, the fibres interlacing or at times arranged concentrically. The consistency of the mass depends upon the proportion of fibrous and muscle tissues. The more muscle tissue there is present the softer the tumor, and similarly with the increase in muscle tissue the color of the tumor becomes more and more pink in place of the grayish, asbestos-like color of the pure fibroma.

The muscle cells are arranged in bundles surrounded by connective tissue. They are the unstriped muscle cells varying in length from 0.045 to 0.48 mm. in length. They are spindle-shape and polygonal on cross-section. The ends are pointed or branching. The nuclei are elliptical and contain several nucleoli. The fibrous tissue cells are often hard to distinguish from the muscle cells. They, too, are spindle-shaped but usually longer, and their nuclei are usually smaller and scantier, but with the same multiple nucleoli. The bloodvessels are more numerous in the myomata. Their adventitia is regularly absent, and this has led to the theory that the origin of the fibroid tumors is from the walls of these uterine vessels.

In one special type, the adenomyomata, certain of the gland elements are found intermingled with the fibrous and muscle tissue. These gland elements have come possibly by inclusion from the endometrium or, according to Cullen, are derived from Müller's ducts. The gland secretion is retained, giving a soft or cystic character to the fibroid. In these cases the tumor masses are usually not encapsulated, but are more diffuse and are found most often on the posterior wall of the uterus at the angles near where the tubes are inserted.

Etiology.—The direct cause of the occurrence of fibromyomata is unknown. They are thought by some to originate as myomata in the muscular layer of the bloodvessel walls due to some change in its growth, but the more generally accepted theory is that they arise from the muscle fibres of the uterus. Others have suggested that the fibroids are developed from embryonic inclusions, possibly from Wolffian duct remains. Leopold claims to have found elementary myomata in children. The possibility of heredity acting as a factor in the causation of fibroids has been urged. Beyea cites one instance in his own practice where fibroids were found in four sisters, the mother, aunt, and grandmother. In this case it would seem to be something more than a coincidence, even though fibroids are so common. Syphilis has been urged as a

possible cause of fibroids, but they certainly occur in many cases where there is no other trace of syphilis and they do not respond to anti-syphilitic treatment, so that such a cause can be ruled out. Similarly, celibacy has been urged as the cause of fibroids, but that, too, is certainly absent in the history of a large number of cases. In this connection it was thought that if the physiological hypertrophy of the uterine tissues, which would normally occur in pregnancy, did not take place that a pathological hypertrophy in special areas followed. But this does not hold good, for a history of pregnancy is present in a large number of the women having these tumors. Persistent stimulation of the uterus, whether by masturbation, unsatisfied coitus, prevented conception, psychic sexual stimulation, or whatever other means, though not proved to be the cause of fibroids, is believed by some to be a factor in many cases. It does not, however, account for the occurrence of fibroids in the young or in the multipara, so that this, too, cannot be considered the sole or essential factor.

Symptoms.—The symptoms that call attention to the presence of the tumors vary considerably. The tumor may persist for years, especially if it be subserous, without attracting the attention of the woman, and may first become apparent when the size of the mass becomes noticeable. More often, however, bleeding or pain is the first and most prominent symptom of the trouble. In rare cases the reflex neuroses call attention to the presence of the uterine tumor.

The first and most suggestive symptom is *hemorrhage*. The bleeding is from the mucosa of the uterus and is most marked in the submucous variety, especially those that have been assumed the polypoid character. Hemorrhage usually is entirely absent in the subserous form. The bleeding may occur either with the menses, increasing the usual quantity of the flow so that it lasts anywhere from two to fourteen days, or it may occur between the usual menstrual periods at irregular intervals. The blood that comes with these fibroids may be either coagulated or not, there being nothing characteristic about it. Between the hemorrhages there may be a serous discharge which is, at times, discolored.

As the result of these repeated and extensive hemorrhages there gradually comes on a chronic *anæmia* with a marked decrease in the percentage of hæmoglobin. In a series of 100 cases treated at the Johns Hopkins Hospital, Hunner reported in the neighborhood of 40 per cent. of hæmoglobin in 9 cases, 33 per cent. in 3 cases, and in 1 case there was only 22 per cent. The bleeding seems to be more profuse as the fibroid continues to grow, so that the older the woman the more likely the hemorrhage is to be severe and its effects more marked. In Hunner's series, 12 of the cases were over fifty years of age, and of these 12, 9 had profuse hemorrhages. The chronic and progressive anæmia leads to the usual train of symptoms of which those depending on the degenerations of the heart muscle and kidney deserve special mention on account of their importance in prognosis and as affecting the results of operation. The myocarditis and nephritis are conditions that not merely affect the probabilities of the immediate

outcome of any operation, but even if the fibroid is removed these degenerations remain to dominate the life of the woman.

Between the intervals of the bleeding there is frequently a mucous or mucopurulent discharge from the uterus due to the inflammatory condition of the endometrium. In the cases where the fibroid becomes gangrenous this discharge becomes more profuse and the necrotic tissue gives it a dirty color and a foul, stinking odor similar to that in cancer cases. In cases of lymphangiectasis in the fibroid where there may be lymph cysts the discharge is at times very profuse. Veit cites one instance where the secretion was sufficient to wet the sheets of the bed at night up to the patient's shoulders.

The second prominent symptom is the *pain*, which, though present in many of the cases of fibroid tumors, is not a necessary consequence of the presence of the tumor. In many cases it is entirely absent. When present it may be of many different forms depending upon the cause. The mere presence of the tumor does not call forth any pain. The attempts of the uterus to expel the foreign mass tend to produce rhythmical pains similar to those of labor. These seem most marked at the time of the menstrual flow and give one type of dysmenorrhœa. In some instances there is pain due to the tension on the uterine walls from an excessively rapid rate of growth of the tumor in the dense uterine tissues. This pain, due to the increase in size of the tumor, is most marked at the time of the premenstrual congestion and is usually eased with the menstrual flow. When the pain is disproportionate to the size of the mass, and apparently due to the rapid increase in size, some form of degeneration that tends to rapid growth, such as sarcoma, is suggested.

There is frequently pain from compression of the other pelvic organs by the tumor. Compression of the rectum, bladder, and sacral plexus of nerves each gives its own characteristic type of pains. When the uterine mass fills the pelvis and becomes incarcerated in the hollow of the sacrum, whether the increase in size is due to simple growth of the fibroid, some degeneration, or pregnancy, there is produced a constant, dull, boring, aching pain in the sacrum that is relieved only when the incarceration is released. In the instances where the pedicle of a subserous fibroid is narrow and the tumor becomes twisted on its pedicle there is pain due to the consequent inflammation of the fibroid (a fibroiditis), and later possibly from the peritonitis that this tends to produce. Such pains frequently recur, and if the condition is not treated by operation, tend to occur in attacks at irregular intervals.

The third symptom, or rather group of symptoms, is due to the presence of the tumor which decreases the capacity of the pelvis and the abdomen, and interferes with the physiological activities of the other organs. In the pelvis the fibroid, whether itself growing from the anterior wall or pushing the uterus forward, irritates the bladder or urethra, producing bladder symptoms, such as vesical tenesmus, frequent or difficult micturition, or retention of urine. In a smaller number of cases compression of the ureters in the broad ligaments gives a similar train of

symptoms. Here more frequently there is a damming back of the urine into the pelvis of the kidney with hydronephrosis and hydroureter, nephritis, or a purulent inflammation of the urinary tract. In this connection may be noted, for the sake of distinction, the cases of anuria following the administration of the anæsthetic for either radical or palliative treatment.

Somewhat less frequent are the cases where the fibroid causes pressure on the rectum or colon with a similar train of symptoms—rectal tenesmus, difficult defecation, intestinal obstruction; and the effects higher up in the alimentary canal most prominently indicated by the distention of the intestines with gas, intestinal fermentation, etc.

Those tumors, which interfere with the circulation of blood through the iliac vessels, lead to varices in the tributaries of both internal and external iliac veins, possibly to thrombosis of these vessels and subsequent embolism.

Pressure on the nerves of the sacral plexus leads to the pains in the branch that is compressed. A certain number of the cases of sciatica are accounted for in this way.

As the uterine mass grows out of the pelvis and occupies the abdominal cavity the interference with the activities of the intestines is more marked and there is more or less interference with the action of the diaphragm, the breathing, and the action of the heart. The presence of the tumor in the lower part of the abdomen is usually noticed by the woman, even if the preceding gradual increase in size of the abdomen has been too slight and too gradual to attract attention. The rate of growth is usually so slow that the abdominal wall, instead of being tense as in pregnancy, is more lax and this allows an abnormal mobility of the mass in the abdominal cavity, especially of the pedunculated subserous fibroids. Hence we get the cases of rotation of the tumor on its giving the acute symptoms of torsion of the pedicle which are similar to those of torsion of the pedicle of an ovarian cyst. The acute onset of pain, the nausea and vomiting, the rapid increase in size of the tumor, the acute peritonitis may all pass off, and the patient be apparently well again, to have a recurrence of the same symptoms in a later attack.

In rare cases these patients have disturbances of respiration or of the circulatory system not dependent upon interference with the action of the diaphragm or to the size of the tumor, but occurring when the mass is still limited to the pelvis. Such symptoms we group as reflex neuroses, though we may not be able to identify the nerves involved.

The rate of growth of uterine myomata in most cases is very slow. Many of them always remain of very small size, especially the hard encapsulated fibromata. The soft myomata with a capsule rich in bloodvessels grow much more rapidly. The rate of growth increases with the premenstrual congestion and the increased vascularity of pregnancy. There is also often a marked preclimacteric growth. Usually, the fibroids appear at about the age of twenty-five years and grow slowly until the age of forty-five or fifty. After that the rate of

growth usually becomes less and some form of degeneration, calcareous or otherwise, sets in. Exceptionally, they begin to cause symptoms after the menopause. A postpartum or postclimacteric atrophy has generally been taught, but such an atrophy is probably not the rule and would seem to be the exception.

Diagnosis.—In making the diagnosis of fibromyomata we have to consider the history of the woman, the general examination of the body, and the local examination of the uterus. The history of bloody vaginal discharge, whether occurring as metrorrhagia or menorrhagia, persistent and increasing in quantity; of compression symptoms, whether interference with bladder, rectum, bloodvessels, or nerves; sterility; repeated miscarriages, or births with malpresentations; the history of any of the complications of the course of the tumor all point toward its presence, and the more of these points that are brought out the greater the probability that the physical examination will find a tumor.

The general examination in the early periods shows nothing characteristic, but later as the effects of the fibroid become more marked the general examination becomes more significant. The presence of anæmia may not infrequently be noted. This anæmia is to be distinguished from the appearance of cachexia due to malignant disease that may give the same history. Myocarditis and nephritis as the results of the anæmia should be looked for. Varices of the legs and of the tributaries of the internal iliac veins or thrombosis of these vessels with the consequent swelling may be found.

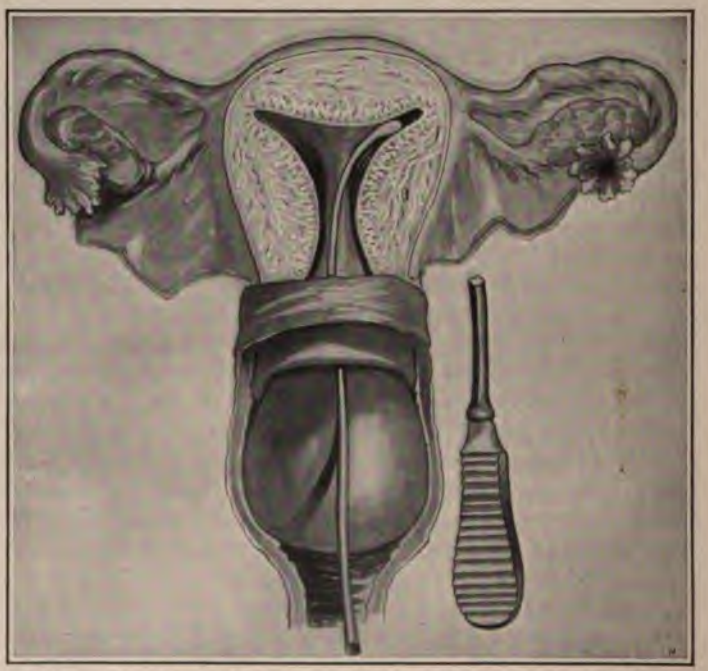
The abdominal examination may show the presence of the tumor mass in the pelvic regions; the hard, solid, or the cystic more or less fluctuating mass of the softer myomata or of the degenerated tumors. The hard multiple nodules attached to the movable uterus are characteristic. Percussion over the mass if it is in contact with the abdominal wall is, of course, flat.

Auscultation may find a uterine souffle in the large nutrient vessels of the tumor. Less often a faint thrill due to the blood in these large vessels may be perceptible to the touch.

The vaginal examination is the most important part in the diagnosis. There is frequently a catarrhal discharge moistening the vagina and even the labia. This discharge may be bloody or blood-stained during a large part of the time. In the necrotic cases this discharge may have a characteristic foul odor, and on microscopic examination show mucus, red and white blood cells, and broken-down tissue cells. The vaginal mucous membrane may have assumed a slightly cyanotic color that some gynecologists claim to be able to distinguish from the violet hue of pregnancy. There may be present the varices of the labia or of the vaginal vessels. Palpation usually finds the cervix firm, but, perhaps, slightly more softened than is normal. The position and size of the uterus vary in each case with the size and location of the fibroid masses. The one point which is characteristic is the presence in the uterus of one or more sharply circumscribed firm tumors surrounded by less firm tissue of the uterus. The ovaries and tubes may at times be felt

distinct from the mass and moving independently of it. To identify the ovaries in some instances it may be necessary to have the uterus pulled down by a volsellum in the cervix while the examiner makes the bimanual examination of the fundus of the uterus. In some cases it may be even desirable to make a rectal examination in addition to a vaginal examination in order to palpate higher on the posterior wall of the uterus, and it may be wise to combine traction on the cervix with this rectal examination. Fibroid polypi may be felt protruding through the cervix and may be seen with the speculum. In other cases the polypi that do not all the time present in the vagina may

FIG. 201



Submucous pedunculated myoma, resembling an inverted uterus. (Dudley.)

be felt at the internal os or even at the external os at the time just before the menses and may simulate a cervical abortion. Cervical and intraligamentous fibroids are usually felt without much difficulty. If a sound is passed into the uterus in submucous and interstitial fibroids the cavity of the uterus will be found to be much distorted. The sound may pass to the fundus of the enlarged uterus or it may be blocked before it reaches that point by some fibroid that fills the cavity. If it reaches the fundus it will have an abnormal lateral mobility and possibly the fibroid masses that project into the uterine cavity may be outlined with the sound.

Differential Diagnosis.—The occurrence of fibroids is so common that it may not be out of place to mention a few points in the differentiation of this condition from the many others with which it is liable to be confused. Of course, the fibroid may be present at the same time as any of these other conditions.

Anteflexion or *retroflexion* of the uterus is to be distinguished by the absence of any nodule on the surface of the uterus which could be taken for the fundus in the normal position and by passing a sound which will determine the abnormal location of the fundus.

Chronic metritis produces a somewhat enlarged uterus, but the enlargement is uniform, not irregular; the bleeding is less profuse, the catarrhal discharge more marked, the os is often everted and the entire

FIG. 202

Submucous fibroid that has dilated os internum (*oi*) and protrudes into cervix; uterus symmetrically enlarged simulates pregnancy or cervical abortion. (Schroeder.)

uterus sensitive. On the other hand, in the fibroid the os is more usually normal and the uterus not at all sensitive.

Inversion of the uterus might at first sight be mistaken for a fibroid polypus, but in inversion the orifices of the Fallopian tubes can possibly be seen at the lower end of the mass of the uterus and a probe cannot be passed into the uterine cavity as the cervical canal is obliterated. In the polypus, on the other hand, there are no tube orifices and the uterine cavity can be probed.

Normal pregnancy in the early months presents a uterus that is symmetrically enlarged and the whole uterus somewhat softened. In interstitial or submucous fibroids an almost identical condition may be produced, but in the pregnancy the cervix becomes more softened, while in the fibroid the cervix remains firmer.

In pregnancy the menses are absent, while in fibroids the bleeding is increased and the menstruation more profuse. In the later months the positive signs of pregnancy may be found, while, of course, they are absent in the fibroid. The diagnosis of the coexistence of these two conditions will be considered in the section on the complication of fibroids by pregnancy.

In *incomplete abortions*, or cases where the fetus dies and is not expelled from the uterus but becomes desiccated, the uterus contracts down on this mass, giving an irregularity in the shape of the uterus that very closely simulates that found on examination in an interstitial or submucous fibroid, and the subsequent endometritis gives bleeding

FIG. 203

Interstitial myoma of the posterior wall which if of soft consistency would resemble a pregnancy. (Winter.)

and discharge that very closely imitates the history of a fibroid. Here the diagnosis can be made only by examination of the interior of the uterus most simply by curettage.

An *ectopic pregnancy* gives irregular hemorrhage after a period of amenorrhœa that should always raise suspicions. There is a mass alongside of the uterus that if the ovum is lodged in the proximal end of the Fallopian tube may appear to be a part of the uterus. The mass is, however, less dense than the majority of fibroids, and is more tender. The ectopic pregnancy, too, is usually associated with the sharp attacks of pain and collapse that are significant of more than the fibroid; it is always lateral. There may be given off in the uterine discharge a portion of the decidua.

The *pelvic hæmatocele* would probably only in its later stages be confused with fibroid. It is of rapid development, accompanied with sharp pains, is sensitive, and is not connected with the uterus. In the early stages it is soft and diffuse, but later becomes firmer and more easily defined.

The *pelvic exudate* occurs after a history of possible infection. Like the hæmatocele, the development is rapid. It is tender and the uterus is fixed in position. The consistency is at first hard, but later becomes softer and may fluctuate. It is associated with the constitutional symptoms that accompany septic processes in general; the fever, chills, prostration and the increased leukocytosis.

The *pus tubes* give a similar history, but the examination shows masses that are more or less separate from the uterus instead of being intimately connected with the uterus, and are usually symmetrical and bilateral.

Ovarian tumors, especially fibromata and dermoid cysts, may closely resemble uterine fibromyomata. The cystic ovarian tumors can generally be easily distinguished by their fluctuation and by being found to be distinct from the uterus on examination. The pedicle by which they are connected to the uterine cornu can, as a rule, be distinctly palpated by rectal examination with the uterus drawn down by means of a tenaculum forceps. Fibromata and dermoid cysts are both frequently adherent and are very frequently mistaken for uterine tumors. Intraligamentary cysts can be easily mistaken for degenerated myomata. Their situation and greater degree of fluctuation should distinguish these tumors. Malignant tumors of the ovary may be confounded with uterine fibromyomata, especially when the latter have undergone malignant degeneration. They are, however, of more rapid growth and produce more marked general symptoms. It is usually a matter of no great importance to make a differential diagnosis, as a laparotomy is usually indicated in any case.

Carcinoma and *sarcoma* of the endometrium can usually be distinguished from fibromyomata by the uterus being softer, more symmetrical, and by producing greater constitutional symptoms. The only certain method of diagnosis is by curettage and examination of the tissue histologically.

Sarcomatous degeneration of fibromyomata is considered in the section on sarcoma of the uterus.

The most serious mistake to make is to confound a soft myoma with pregnancy or *vice versa*. This not infrequently happens even with experienced practitioners. A careful history and repeated examinations should prevent such mistakes, which are the result usually of careless and hasty examinations.

Prognosis.—A certain number of cases of fibroids give no symptoms or inconveniences. This applies not merely to the small fibroid masses, but also to some tumors that rise above the level of the navel. Many of the cases are excellent in their outlook so far as life is concerned, but are the cause of a great deal of annoyance and discomfort, or even

invalidism. However, in general it may be said that in a woman in the early thirties, if the tumor is submucous or interstitial and rises to the level of the umbilicus, that the tumor will very probably threaten life or give severe symptoms even without the occurrence of complications. In older women, who have reached the age of forty-five or more, subperitoneal tumors of the size of the previous class, if that large size is due to the premenstrual swellings and the size decreases after the menses, probably will decrease in size after the menopause, so that it is generally advisable to await symptoms before undertaking radical treatment.

In a few cases there is an atrophy of the fibroids after the menopause with a decrease of the symptoms. More commonly, however, the menopause is followed by degeneration of the fibroids. The menopause is usually postponed to between fifty and sixty years of age. That the menopause does not bring the atrophy of the fibroid that has been commonly taught is shown by the large proportion of the cases that come to operation in later life. Of 100 cases operated on by Sharlieb, another 100 reported by Hunner, and 225 reported by Noble where the ages of the patient at the time of operation are given, nearly two-thirds are over forty years of age, about 12 per cent. over fifty years, and 3 to 4 per cent. over sixty years of age.

CHAPTER XV.

FIBROMYOMATA OF THE UTERUS (*Continued*).

By G. BROWN MILLER, M.D.

DEGENERATIONS AND COMPLICATIONS.

Recently attention has been called to the importance in the prognosis of the *degenerations* to which the tumors are liable and the complications with which they are associated. (See the papers of Noble, Martin, Cullingworth, Frederick, Hunner, Sharlieb, MacDonald and others.) A word or two as to the occurrence and frequency of the degenerations of these fibroid tumors may be helpful.

Simple atrophy of the fibroid, not a true degeneration, does, at times, occur with involution of the genitals after pregnancy or the menopause.

Calcification of the tissues of the fibroid leading to the formation of "womb stones" also, at times, occurs, usually with increasing age. Such uteroliths are usually composed of the carbonate and phosphate of calcium and may be of considerable size. Emmet found one weighing over two kilograms (four pounds).

Fatty degeneration occurs slightly less frequently than calcification, especially in the soft and interstitial or submucous fibroids. Less often it is found in the subserous tumors.

Amyloid degeneration of the uterine muscle and of the fibroid substance occurs usually only when associated with similar general degenerations in other organs.

Myxomatous degeneration like the fatty is more common in the submucous and interstitial forms than in the subserous. It begins in the intercellular substance and leads to the formation of cysts which may so compress the rest of the tissues that they may become fibrous again. The muscular layer of the arterial walls is often markedly involved. This myxomatous condition is frequently associated with œdema of the fibroid and the two conditions are grouped together by Cullingworth and Sharlieb in their classification of these degenerations. Taking œdema and myxomatous degeneration together they are responsible for more of the cases of degeneration of the fibroids than any other cause except necrosis.

Necrosis may occur in either of two forms, either the non-infected called necrobiosis, like the maceration of the fetus in the uterus. This form is more common in the large interstitial fibroid and produces comparatively slight symptoms. If, on the other hand, the fibroid in the course of its necrosis becomes infected, either from the peritoneal surface (from the colon) or from the mucous surface (possibly from curettage), more marked sapræmic or septic symptoms are developed.

Necrosis is due, of course, to decreased nutrition of the tissues of the fibroid. Such may arise from poor general health, anæmia, pregnancy, and similar conditions, or from the treatment to which the fibroid has been subjected; ergot, electricity, or curettage. The symptoms produced by the sloughing of a submucous fibroid may be the same as those obtained in the clinical history of cancer of the uterus, but examination will show the growth to be tough rather than friable and the microscopic examination of the detritus will give the correct diagnosis. The symptoms of the subserous fibroid that has become necrotic are

FIG. 204

Fibrocystic myoma uteri. The interior of the tumor shows the fibrocystic changes. (Dudley.)

those of peritoneal inflammation, either localized, as a pelvic abscess, or diffuse. Olshausen reported one case where such a necrotic fibroid led to a peritoneal abscess which was fortunate enough to empty on the skin.

Inflammatory processes in the fibroid may take the form of round-cell infiltration or suppuration and occurs fairly frequently.

Changes in the vessels of the tumor lead to œdema and infiltration of the tumor. They occur most commonly with incarceration of the uterus or with torsion of the pedicle. Uncomplicated, they lead to obstruction of circulation in the branches of either the external or internal iliac veins. If the thrombus becomes infected there are the

complications of sepsis and septic emboli. Telangiectases in the blood-vessels or lymph-vessels lead to large endothelial cysts.

Of the *mixed tumors, cystic degeneration of the fibroids* is the most common. Here the growth of the tumor becomes much more rapid, but the symptoms are only slight. The examination tends to confusion with ovarian cysts.

Sarcomatous degeneration of the fibroid occurs fairly often. It is marked by a rapid increase in the rate of growth of the tumor. In gross examination they are frequently indistinguishable from simple fibroids, and may not be suspected even after removal until secondary masses appear in the pelvis. Even the microscopic distinction between the simple fibroid and the myosarcoma is often difficult and misleading. Ulesco Stroganowa reported 10 cases of sarcoma according to microscopic examination in 100 successive cases examined. Such a proportion we know to be clinically much too large. MacDonald, in 280 cases, found sarcomatous degenerations to have occurred three times. He found the sum total of sarcomatous degeneration in 788 cases from cases of Martin, Noble, Cullingworth, Scharlieb, and Frederick to have been 17, that is, over 2 per cent. of all the cases examined. This is, perhaps, a low estimate, as it is hardly possible but what some sarcomatous areas escaped observation.

Carcinomatous degeneration of the fibroid tissues cannot take place. But in the cases where there is involved a certain portion of gland tissue there may arise the adenocarcinomata. Again, the epithelium covering the intrauterine surface of the fibroid is subject to abnormal conditions and is more liable to undergo carcinomatous changes which may secondarily involve the fibroid by direct extension, though such an extension is rarer on account of the density of the fibroid tissue. Cullen reported only 2 cases of carcinomatous invasion of the fibroid from the endometrium, while he gives 10 cases of adenocarcinoma occurring with fibroids.

While both of these classes of carcinoma of the uterus may lay their cause to the presence of the fibroid, such can scarcely be claimed in the cases where carcinoma of the cervix complicates fibroids, which it not rarely does. The diagnosis in some of these doubtful cases may be determined by microscopic examination of the curettings from the uterus.

Myochondroma is so rare as scarcely to need mention.

Complications.—The complications which occur with fibroid tumors of the uterus are of great variety even if we exclude the accidental conditions that may coexist. The complications which are dependent upon the presence of the tumor are found in the uterus, tubes, ovaries, and pelvis, and extend to the entire abdomen or even to the entire general system.

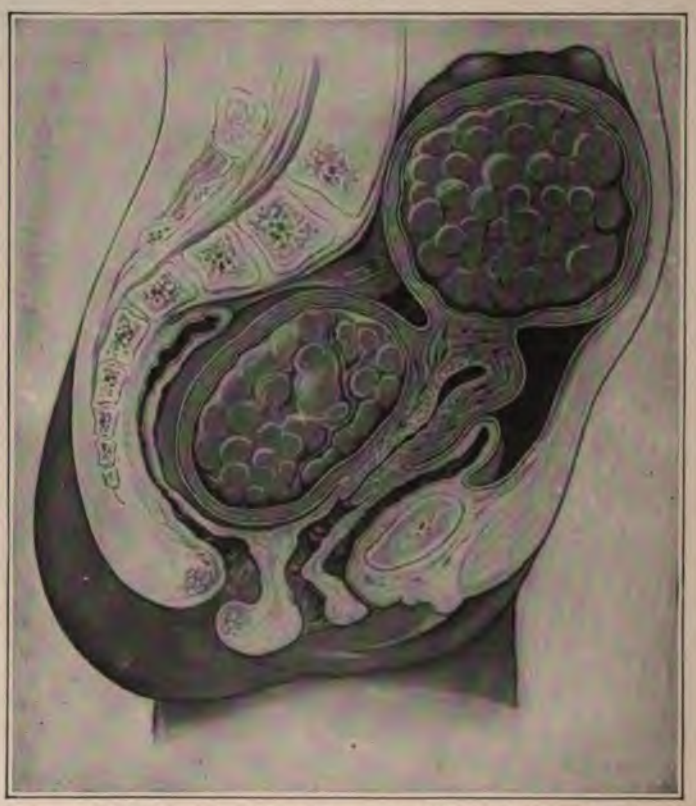
In the uterus we have the location of the tumor. If the fibroid arises from the cervix and grows forward toward the bladder or backward toward the rectum it is apt to cause marked disturbances of these organs, even while the tumor is of small size. If the tumor arises even somewhat

higher, and grows out laterally into the broad ligament, there is apt to be more interference with the ureter and compression of the pelvic vessels.

The position of the uterus is often modified, especially by the subserous or interstitial tumors, causing displacements and flexions of the uterus. Perhaps the most common is retroversion. And as a sequel of the retroversion there may follow a more or less complete procidentia.

Inversion of the uterus may be the consequence of a submucous fibroid. The engorgement and softening of the uterine wall, combined

FIG. 205



Intramural myomata. The lower tumor exerts pressure on all the pelvic organs. The upper tumor displaces the uterus upward by traction. (Dudley.)

with the constant attempts of the uterus by its own contractions to expel the fibroid tends to produce a more or less complete inversion.

Incarceration of the uterus in the pelvis is due to the growth of the fibroid and the uterus until either the tumor or the fundus of the uterus impinges on the sacrum beneath the promontory. Then, as the growth continues and the uterus cannot rise above the promontory there occur the pains due to pressure on the sacrum and the interference with the ...vth of the fibroid, possibly with necrosis of a portion of its tissues.

Torsion of the pedicle of a subserous fibroid occurs we scarcely know why. There must be a certain amount of freedom or movement of the fibroid to allow the twisting of the pedicle. It is followed with more or less complete obstruction of the nutrient vessels of the tumor and its consequent necrosis. But this torsion may not be sufficiently marked to cut off all the blood supply on its first occurrence so that repeated attacks marked by severe pain and collapse are liable to occur before the final necrosis of the tumor.

FIG. 206

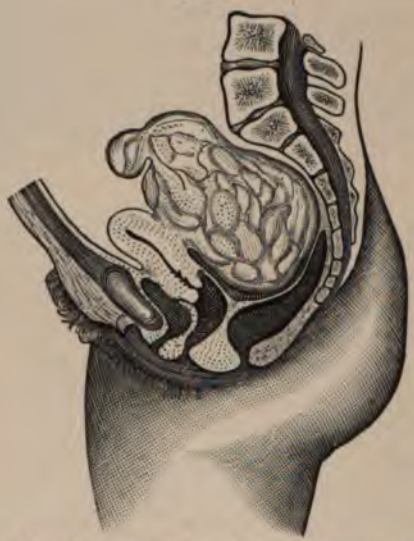
Inversion and prolapse of the uterus due to fibroid; *M*, myoma; *U*, uterus; *P*, mucous polyp. (Schroeder.)

Delay in the appearance of the menopause is very commonly caused by the presence of these tumors, the menopause frequently not occurring until the patient is between fifty and sixty years of age.

Compression symptoms from the pressure of the tumor on the neighboring pelvic structure or even those in the abdomen are often the most prominent symptoms and the most important. *Pressure on the rectum* leads to a primary irritation with more or less rectal tenesmus. When the pressure becomes sufficient there is difficulty in moving the bowels,

which may lead to most obstinate constipation or even intestinal obstruction.

FIG. 207



Subserous fibroid from posterior wall filling the pelvis. (Schroeder.)

FIG. 208

Distortion of bladder produced by an interstitial fibromyoma.

Pressure on the urethra and bladder lead to frequent, scanty urination, with normal urine; or, if a cystitis is set up, foul urine. Marked dis-

tortion of the bladder may be caused by the growth of an interstitial tumor which arises from the anterior uterine wall low down. Pressure on the urethra may cause complete retention of the urine of gradual onset. This condition is often associated with an inflammatory process in ureters and kidneys. Compression of the ureters, whether unilateral or bilateral, is always a very serious complication. If unilateral there may be no apparent interference with the passage of urine and the condition may go on unnoticed until the ureter is dilated and inflamed and hydroureter and hydronephrosis or the corresponding infected states are found. If the obstruction is bilateral complete retention of urine is found.

Compression of the pelvic bloodvessels by the tumor leads to varices or thrombi in the vessels and the subsequent conditions that are expected with these obstructions to circulation, whether aseptic or septic.

Pressure on the nerves in the pelvis leads to acute pains and neuralgias, many cases of sciatica being so accounted for, or if the nerve is compressed so as to be atrophied there is absence of sensation and paralysis.

In the Fallopian tubes we find probably the most frequent complications of the fibroid tumors of the uterus. These may be either symmetrical or unilateral and may take the form of either hydrosalpinx due to blocking of the ends of the tube and the retention of mucous secretion and epithelial detritus; pyosalpinx from infection, salpingitis from an acute inflammation of the tube or a slower process with thickening of the tube walls; hæmatosalpinx with bleeding into the exudate or due to an ectopic pregnancy.

The ovaries show changes associated with the fibroids in the uterus probably as often as the tubes. Veit considers that the ovaries are always more or less changed by the increase in size and number of Graafian follicles and an increase of connective tissue. Certainly cystic degeneration of the ovaries and ovarian cysts occur the most frequently of any one complication. Abscess of the ovary and hæmatoma occur at times. Carcinoma of the ovary when primary can probably not be attributed to the fibroid, though secondary involvement may be.

General abdominal complications are at times due to the fibroid condition of the uterus. Interference with the action of the intestines leads to disorders of the alimentary canal; large fibroid masses may even interfere with the action of the diaphragm, lungs, and heart; and the distention of the abdominal wall leads to its weakening and a tendency to abdominal hernia. Ascites may, in rare cases, be due to the tumor primarily, but more often is due to some inflammatory or degenerative change in the tumor. Kelly cited one case of uterine fibromyoma in which there were removed twelve pints of ascitic fluid. Inflammatory abdominal conditions resulting in adhesions that start from the tumors are very common and may lead to any of the results that follow such pathological changes, whether in the acute stage or later after partial absorption and organization of the new tissue. Among these consequences may be noted intestinal obstruction, peritonitis, and appendicitis.

More remote but still distinctly traceable to fibromyomata are the constitutional effects of the bleeding on the patient. In rare cases a dangerous condition arises from an acute anæmia. But more often it is the result of the repeated bleeding of the chronic anæmia that is more serious. The depleted blood condition tends to the formation of thrombosis (as in all anæmias) and the secondary inflammation of these thrombi or the production of embolism. The decreased nutrition carried by the blood tends to a degeneration of all the viscera, which shows itself most prominently in the atheroma of the bloodvessels, the fatty degeneration of the kidneys, and the brown or fatty degeneration of the heart muscle. These conditions are all the more serious because they are permanent, and are not recovered from even if the anæmia is improved or the tumor that caused it removed. The general malnutrition of the body is but another evidence of the anæmic condition, which, with its decreased resistance, renders the body to increased liability to the complication of all the infectious diseases.

The *anæmia* produced by the bleeding from these tumors is often extreme. Hunner reports that at the time of operation 9 of his cases had the hæmoglobin reduced at the time of operation to 46, 3 to 33 and 1 to 22 per cent. All of these cases recovered. Noble reports 1 case where the hæmoglobin was only 10 per cent. and the red blood corpuscles 2,325,000. There was a marked leukocytosis of the usual type. Here he did a curettage and waited some ten weeks until the blood examination showed 55 per cent. hæmoglobin and 3,760,000 red blood cells and then performed the indicated hysterectomy. The presence of these marked anæmias adds to the risk at the time of operation by increasing shock, and the chances of œdema of the lungs and sepsis.

If in giving the prognosis of fibroid tumors we include these complications the danger is markedly increased. Noble in his paper in *American Gynecology* for April, 1903, collects the statistics from 688 cases treated by himself, Martin, Frederick, and Cullingworth. Of these the number of deaths from the tumor itself or from the uterine complications of the case if not operated on is estimated by Noble and Martin at 16 per cent., and by Frederick and Cullingworth at 23 and 24 per cent., respectively. The deaths from all complications are estimated by Noble and Martin at 45 and 46 per cent., respectively, and Frederick considers the fatalities to be as great. So that Noble concludes that without operation at least one-third of the cases will be fatal, one-fourth chronically invalided, and most of the remainder incommoded. If this proportion is established by the experience of others, as it seems to be, it certainly, as Noble says, is a strong argument for early operation, as the conservative treatment for the mortality of myomectomy and hysterectomy is from 2 to 10 per cent. now and would be lower in earlier operations, and there would be a marked decrease in the morbidity.

CHAPTER XVI.

THE TREATMENT OF FIBROMYOMATA OF THE UTERUS.

By G. BROWN MILLER, M.D.

THE existence of a fibromyoma in the uterus of a woman is not of itself an indication that she needs treatment of any kind. Many women have these tumors and have no symptoms referable to them. The discovery of the tumor renders it imperative, however, that the patient should be kept under observation and that she be examined at intervals of six months or a year unless her symptoms render more frequent examinations advisable. If the woman has little discomfort from the tumor; if there is no menorrhagia; no marked growth nor evidences of cystic or malignant degeneration of the tumor; no evidence of disease of the kidneys, bladder, bowels, or heart which is referable to the tumor; if it does not interfere with conception in a woman who is anxious to bear children or with labor in a pregnant woman, no treatment is indicated. But when the menorrhagia is marked, with a tumor which is very large or growing rapidly, which is infected or necrotic, which causes much pain or an inability to attend to life's duties, which is undergoing cystic or probable malignant degeneration, which gives rise to bladder, kidney, or bowel disease, which produces cachexia or marked anæmia, which promises to interfere seriously with conception or labor, or which seriously jeopardizes the health of the patient in any way, treatment and usually the *radical treatment* is not only justifiable but advisable. The low mortality of the operation when these tumors are removed early; the added dangers when they become infected, adherent, of large size; the considerable proportion of tumors regarded as fibromyomata which prove to be on microscopic examination sarcomata; the increased dangers of thrombosis, embolism, heart and vessel changes when the tumors reach considerable size, are causing gynecologists generally to advise operation in the majority of cases when the tumors cause well-marked symptoms or has attained a considerable size. The unreliability and frequently the dangers attending the palliative treatment, adds to this tendency. The only satisfactory treatment in the large majority of cases is the radical one, that is, the enucleation of the tumor or tumors with or without the uterus or a portion of it. One should bear in mind, however, that there are contraindications to these radical operations even when the symptoms demand them. Some of the most important of these contraindications are the difficulties and dangers which would attend the operation for the removal of the tumors. It is trying to the operator to close the abdomen without having made an

effort to remove a tumor which is interfering with the health of the woman, but it is his duty to his patient when he believes that the risks of the operation are too great to content himself with some form of palliative treatment. In extremely difficult cases it is not an acknowledgment of want of skill, but the sign of good surgical judgment not to attempt the impossible nor to assume risks which are too great. In very large tumors with an enormous blood supply; in intraligamentous tumors filling out the pelvis and rendering ligature of the large vessels impossible except after the loss of large quantities of blood; in tumors where the intestines are so adherent that a resection of a portion of them becomes necessary; where the patient is very weak, has a diseased heart, lungs, or kidneys, and a long, difficult operation would be necessary—in such conditions it is, at times, advisable to be content with the removal of the ovaries, the ligation of some of the large vessels or even to abandon all operative procedure. Rules governing one in such cases cannot be laid down, as the procedure adopted should depend to a degree upon the skill of the operator.

Other contraindications to operation are advanced pulmonary tuberculosis, heart disease in certain cases, acute illnesses, etc. There are also many women who will not consent to operative treatment, even where it is strongly indicated. In such cases, and in certain others where the interference with health as a result of the tumor is not pronounced, palliative treatment must be resorted to.

Palliative Treatment.—The principal objects of this treatment are to lessen the hemorrhage, to prevent kidney, bowel, and bladder complications, to diminish the pain, and to preserve the general health of the patient. It may be conveniently divided into the hygienic, medical, electrical, curettage, salpingo-oöphorectomy, and the ligation of the large arteries supplying the uterus.

Hygienic Treatment.—In the hygienic treatment everything that tends to produce pelvic engorgement or inflammatory changes in the tumor should be avoided as far as possible. Undue exercise, such as riding horseback, bicycling, playing tennis, running a sewing machine, or prolonged effort on the feet, should be interdicted. Excessive sexual intercourse, wearing tight clothing, cold bathing at the menstrual periods, exposure to cold, constipation, or overfilling of the bladder should be avoided. Rest in bed for several days during menstruation is advisable. The knee-chest position with dilatation of the vagina by atmospheric pressure once a day has been recommended. It is at times necessary when there is a retroversion to replace the uterus in the normal position. The patient's general health should be kept as good as possible and the effects of loss of blood combated by iron, tonics, good food, change of air, scene, etc. The urine should be watched with a view of detecting diseases of the kidneys or bladder and the heart occasionally examined. The preparatory treatment of cases for operation is largely hygienic.

Medical Treatment.—The use of medicines in the treatment of fibromyomata has been unsatisfactory. Of the various drugs used, ergot is perhaps the most efficacious. Acting by producing uterine

contractions it tends to lessen the calibre of the uterine bloodvessels and thus to check hemorrhage. This is practically the only indication for its use. It is best given by the mouth in moderate doses repeated three to four times a day during the active hemorrhage. Thyroid extract has been highly recommended both as a hæmostatic and to cause a reduction in size of the tumor. It is given in 5-grain doses three times a day. Its administration has at times caused alarming symptoms and the best authorities have largely given up its use.

Mammary extract, suprarenal extract, hydrastis Canadensis, extract of hamamelis, and many other remedies are used but with very little result. In certain submucous tumors pain is a marked symptom and some sedative is at times necessary. Codeine or morphine in small doses is the most useful.

The Electrical Treatment.—The treatment of uterine fibromyomata by means of electricity has been generally discarded. In a small percentage of selected cases and in very careful hands it is, according to some observers valuable in checking hemorrhage. The Apostoli method which at one time was much used is to-day in America largely confined to electrical therapeutics. The electropuncture of fibromyomata is generally condemned. The application of a weak galvanic current by means of the uterine sound to which is attached the positive pole of the battery in the uterine cavity, while the negative pole is attached to a large pad wet with salt-water applied to the abdomen, is highly recommended by some in checking hemorrhage. The reader is referred to special monographs and works on electrical therapeutics for a complete treatise of this subject.

Curettage.—The presence of fibromyomata not infrequently cause hypertrophic changes of the uterine mucosa and these give rise to increased hemorrhage at the menstrual periods. Hence, in a uterus not markedly enlarged or one whose cavity is not very tortuous a curettage is at times indicated. This procedure in such cases tends to lessen the menorrhagia and has an additional value in enabling us in most cases to detect malignant or tuberculous changes in the mucosa which might otherwise escape notice. As stated in the preceding pages a considerable number of cases have been reported where carcinoma existed in the same uterus with a fibromyoma. Sarcoma also is occasionally found in the endometrium of a fibromyomatous uterus and tuberculous endometritis may rarely occur. In such cases the histological examination of the curetted material would show these changes and make a rational treatment possible. When the hemorrhage is due to a submucous tumor curettage will, as a rule, do no good. The danger of carrying in infectious material is always greater when the vagina and uterine cavity contains stagnating blood. Bacteria, indeed, at times, invade the cavity of the uterus by way of the vagina under such conditions. Hence, extraordinary precautions must be taken in the technique of the operation. The same may be said of intrauterine applications or tamponing, which are occasionally necessary for the hemorrhage.

As a rule, curettage is a safe procedure when done under proper

precautions. Care should be used to outline the cavity of the uterus by means of a flexible sound before attempting to use the curette, and when the cavity of the uterus is tortuous and there is in consequence danger of invading the capsule of the tumor and causing necrosis or infection, curettage is contraindicated.

Salpingo-oophorectomy.—The removal of both ovaries in the treatment of uterine fibromyomata has been practised since 1876. The idea of both Trenholme and Hegar who first adopted this method of procedure was to bring on a premature menopause and thus relieve the patient of the profuse hemorrhages which occurred at the menstrual period. It was discovered in time that many of the tumors underwent a degenerative change after the removal of the ovaries, some decreased in size, and in a few reported cases the tumors almost entirely disappeared. These results may have been due in part to the ligation of the ovarian arteries. Experience also showed that in many cases while the menstruation ceased that irregular uterine bleeding persisted; that the operation is attended by a mortality almost as great as the more radical operation; that only with tumors occupying certain positions in the uterine wall could one hope for good results; that a considerable number of fibroid uteri have either carcinoma of the body or that the supposed fibromyomata are either sarcomata originally or else had undergone sarcomatous or other degeneration; that the presence of a large tumor is a continual menace to the woman's health by causing changes in the vessels, heart, kidneys, by causing intestinal adhesions, constipation, bladder symptoms interfering with recreation and exercise; that the uterus with these tumors is more liable to become infected and finally the steady growth of the tumor frequently continues in spite of the operation. Hence, the prevailing view at present is that the operation has a very limited field of usefulness and in America it is seldom practised. The perfection of the technique of the supravaginal amputation, the complete enucleation, and myomectomy have tended to throw into the background this uncertain method of dealing with these tumors.

There are, however, certain indications for salpingo-oöphorectomy in the operative treatment of uterine fibromyomata. When the situation or the vascularity of the tumor or the condition of the patient is such that its removal would be attended by great danger and where the ovaries are easily enucleated it is a wise procedure to content one's self with the operation which will, according to Hirst, result in checking hemorrhage and reducing the size of the tumor in 75 to 90 per cent. of suitable cases.

The operation is by no means an easy one in all cases. The ovaries are at times difficult to locate on account of the distortion produced by the tumor, and a number of prominent operators have had cases where they could not find both ovaries. They are at times buried in adhesions or form part of an inflammatory mass and are very hard to enucleate entirely, and the failure to remove all of the ovarian tissue renders the operation useless. Again, they may lie so close to the tumor that the application of a ligature without leaving behind some

ovarian tissue is extremely difficult, or the vessels in the broad ligament may be so numerous and enlarged that extreme difficulty is met with in controlling hemorrhage. The appendages are also occasionally intimately adherent to the intestines and when this is the case, especially when they are difficult to expose, the danger of infection due to injury of the bowel is not inconsiderable.

The principal dangers of the operation are hemorrhage, sepsis, ileus, and pulmonary embolus.

The *ligation of the arteries supplying the uterus* is occasionally practised in treating these tumors, but has an extremely limited field of usefulness. It is uncertain, not entirely free from danger, and in the cases where it could be successfully accomplished the removal of the tumor could, as a rule, be almost as easily done. It may be practised in conjunction with the removal of the ovaries. Most operators ligate the four principal arteries supplying the uterus. The uterine arteries are more readily ligated from the vagina by separating the bladder from the uterus so as to avoid injuring the ureters, isolating the uterine arteries and ligating them. The laparotomy is usually necessary in order to ligate the ovarian vessels, although it can occasionally be done by the vaginal route either through an anterior opening or by way of the cul-de-sac of Douglas. The ligation of the vessels may be tried where both ovaries cannot be found or where they cannot be entirely removed in cases where the salpingo-oöphorectomy is indicated.

The Radical Treatment of Fibromyomata.—By the radical treatment of fibromyomata of the uterus is meant the removal of the tumor or tumors with or without the whole or a portion of the uterus. It is conveniently divided into *the removal of myomatous polyps, the enucleation of submucous myomata, vaginal hysterectomy or myomectomy, abdominal myomectomy, abdominal hysterectomy, and panhysterectomy.*

Removal of Myomatous Polyps.—The polypoid tumor may lie in the vagina with only the pedicle extending into the uterine cavity or it may lie in the cervical canal or in the cavity of the uterus.

Where the polyp has been extended into the vagina the enucleation is an easy and simple procedure. Should the pedicle be only small the polyp can be caught with strong tenaculum forceps and twisted off. In case hemorrhage should occur from the pedicle it can be controlled by a ligature, or if this be difficult to apply by a clamp which can be left in place twenty-four hours. With a larger pedicle one of the two following methods can be used. The capsule of the tumor is incised, the fibromyoma shelled out and a few suture ligatures placed so as to control hemorrhage and adapt the raw surfaces. The pedicle soon atrophies or returns to the condition of normal uterine tissue. This method is particularly applicable with a short, thick pedicle. The other method is to cut off the pedicle close to the tumor, hemorrhage being controlled by clamps, which are afterward replaced by sutures. Care should be exercised to determine if a partial or total inversion of the uterus exists and, in such a case, to avoid entering the peritoneal cavity. The Downes electrothermic clamps would seem to be appli-

cable in the enucleation of these tumors where the pedicle is of considerable length and there is no inversion of the uterus.

When the polyp lies in the *cervical canal* with an undilated external os or in the *cavity of the uterus* the operation is not so simple. In these cases it is necessary to dilate the canal sufficiently to allow the tumor to be exposed. With a small tumor and an easily dilatable cervix one may at times accomplish the desired result by means of the Goodell-Ellinger or similar rapid dilators. Hegar's dilators can also be used. The use of the laminaria tent will give much more dilatation than can be accomplished with the rapid dilators, as a rule, but their use is not free from danger of infection and causes the patient considerable suffering. Veit recommends that they be sterilized by being placed in pure liquid carbolic acid, in which they will not swell. The tent is introduced some twelve to twenty-four hours before the operation, care being taken that the vagina and cervix are well cleansed. It is kept in place by a vaginal tampon of some antiseptic gauze. In case the tumor is of considerable size and difficult to expose a useful procedure after the usual dilatation is to cut up the anterior lip of the cervix in the median line, separating the bladder if necessary, as is done in *vaginal Cæsarean section*. After exposing the tumor the enucleation is accomplished as with polyps which have been extruded into the vagina. Hemorrhage inside the uterus can generally be controlled by a tampon. The incision of the cervix should be repaired and the bladder reattached to the cervix, a small gauze drain being placed in the raw area.

The Enucleation of Submucous Tumors.—It is at times advisable to remove submucous fibromyomata by way of the vagina. Tumors which have their origin in the lower uterine segment and which lie largely in the uterine cavity or cervical canal can be, as a rule, readily enucleated in this manner. Occasionally the uterine contractions will extrude the tumor into the cervical canal or vagina and rarely cause a partial or complete inversion of the uterus. In these cases the tumors are usually small and may be readily enucleated by splitting the capsule and by twisting or blunt dissection, the tumor can be shelled from its bed. The oozing can usually be controlled by means of a tampon. Where the tumor lies wholly in the uterine cavity with an undilated cervical canal it is necessary to dilate the canal widely, and, as a rule, to incise the anterior cervical lip after separating the bladder, as described under fibroid polyps. If the tumor is larger and after incising the anterior lip is still difficult to expose one can cut through the posterior lip in a similar manner.

The enucleation of submucous fibromyomata through the vagina has a limited field of usefulness. It should be confined to small tumors which are in the process of extrusion from the uterine cavity. Where the tumors are necrotic or infected it is safer usually to remove the uterus.

Vaginal Hysterectomy.—The enucleation of a myomatous uterus by way of the vagina in selected cases is one of the most satisfactory operations in gynecology. When the removal of the uterus is indicated

and where the tumor or tumors are not too large the operation is generally preferable to the abdominal hysterectomy. A number of French gynecologists, notably among whom are Péan, Segond, Doyen, and

FIG. 209

Radical vaginal operation. Morcellation of an intrauterine myoma. Emmet's method. (Dudley.)

Richelot, have carried the vaginal hysterectomy for fibromyoma much beyond the limit usually adopted. While in skilled hands and in suitable cases it is more rapid and attended with a very low mortality and

with less shock, pain, and general discomfort than in cases of abdominal hysterectomy, its application is limited to a comparatively small number of cases. Where morcellation to any extent is necessary to deliver the tumor the abdominal hysterectomy is, as a rule, an easier and safer operation. A safe rule to guide one in selecting the vaginal route is to choose this method only in cases where the uterus with the tumor masses can be pushed into the true pelvis. In doubtful cases the following indication may serve a useful purpose: In a woman with very thick abdominal walls and wide vagina with a freely movable uterus the vaginal operation is indicated; in nearly all other cases the abdominal operation is to be chosen. Much depends of course upon the preference and experience of the operator.

In the average case the following is the *technique* of the vaginal hysterectomy: The cervix is caught with one or more of Doyen's morcellation forceps and is pulled down as far as possible, strong traction being made. The vaginal mucosa is next incised around the cervix and in the median line over the bladder for an inch or more. The cervix is freed from its connective-tissue attachments to the bladder and parametrium by blunt dissection, keeping as close as possible to the cervical tissue. This dissection is continued anteriorly until the peritoneal cavity is opened unless the bladder is attached very high upon the uterus; the cul-de-sac of Douglas is opened in the median plane behind and the opening enlarged laterally by means of two fingers or by blunt dissection. Laterally the cervix is separated from its attachments until the large vessels are approached, when these are cut between two powerful clamps, which include an inch or more of tissue, and applied as close as possible to the cervix. These can be replaced by strong whipping-suture ligatures, catgut or kangaroo tendon being used for the external tissue and silk for the cervical tissue. The uterus can now be drawn farther down and clamps placed higher on the parametral tissue. This is successively done, the clamps being replaced or not by suture as may be indicated until the uterus with its tumors is entirely severed from its attachments and removed. The clamps remaining attached to the parametrium are replaced by suture ligatures. The tubes and ovaries are removed or not as may be thought desirable. After checking all hemorrhage the peritoneum is brought together above, the incision into the anterior vaginal wall closed, a few sutures are placed so as to partially adapt the anterior to the posterior vaginal wall, and a gauze drain placed in the raw area which had been occupied by the uterus.

The procedure described above can only be used when the tumors are of small size and the uterus is fairly symmetrical. Where the tumor masses are too large to be drawn down or delivered by the vagina *morcellation* is used. The usual procedure here is to separate the bladder and parametrium (ligating the uterine vessels if possible) and open the cul-de-sac of Douglas. The anterior lip of the cervix and anterior uterine wall are incised by dragging down the uterus through the anterior opening. As the uterus is dragged down wedge-shaped pieces of the

tumor and uterine wall are cut away, the bases of the wedges being toward the periphery. Before each piece is cut away the wall is grasped in another place. One should avoid the outer uterine wall, as here the freest hemorrhage is encountered. In this manner the tumor may be so reduced in size that the uterus can be readily brought into the vagina, the ovarian vessels ligated, and the remains of the uterus and tumor removed.

In any case when the fundus can be delivered into the vagina this should be done, as it makes the operation both safer and easier than it would otherwise be.

The clamps may be left upon the large vessels when a rapid operation is necessary, the sutures difficult to place, or where there is hemorrhage which cannot be readily controlled by sutures.

MYOMECTOMY.—The removal of subperitoneal tumors may be accomplished by way of the vagina. When the tumors are of small size the fundus uteri with its tumors can be brought into the vagina or outside the vulva, preferably through an opening between the uterus and bladder or at times through an opening into the cul-de-sac of Douglas. The tumors are enucleated, the raw areas left in the uterus by their removal sutured and the fundus returned to the peritoneal cavity after all hemorrhage has been controlled. This operation is rarely indicated.

ABDOMINAL OPERATIONS FOR FIBROMYOMATA OF THE UTERUS.—The removal of fibromyomata of the uterus, with or without this organ, through an abdominal incision is one of the most satisfactory operations in abdominal surgery. It is adapted to the removal of almost any tumor except fibroid polyps or submucous tumors situated in the cervical canal or lower uterine segment. It gives a much better view of the field of operation consequently allowing a better choice of the necessary procedure, and allows an inspection of the abdominal viscera. With tumors larger than the fetal head, where diseases of the ovaries or tubes are present, where inflammatory processes of the vermiform appendix, disease of the bile passages, intestines, kidneys, liver, pancreas, etc., are suspected, or where an umbilical hernia is present the abdominal operation is indicated.

ABDOMINAL MYOMECTOMY.—The removal of the tumor or tumors which are causing the patient's symptoms without at the same time unsexing her is the ideal operation. Assuming that a radical operation is necessary there are certain obvious indications for myomectomy, but in the greater number of cases it is by no means easy to know when one should attempt this operation or should remove the uterus together with the tumors. The cases which present no doubt are those of pedunculated tumors unaccompanied by other disease of the uterus or affections of the ovaries and tubes which would require their removal. Here the enucleation of the tumor is the simplest and safest operation. With interstitial or subperitoneal tumors which can be readily enucleated, where it is evident that there are no other tumors present which may later grow and cause trouble, and when the removal of the uterus or ovaries is not otherwise indicated, myomectomy may be done also.

This is especially the case in women who have not passed the menopause and who are desirous of bearing children. In older women the operation which is attended by the least danger to the patient should be performed.

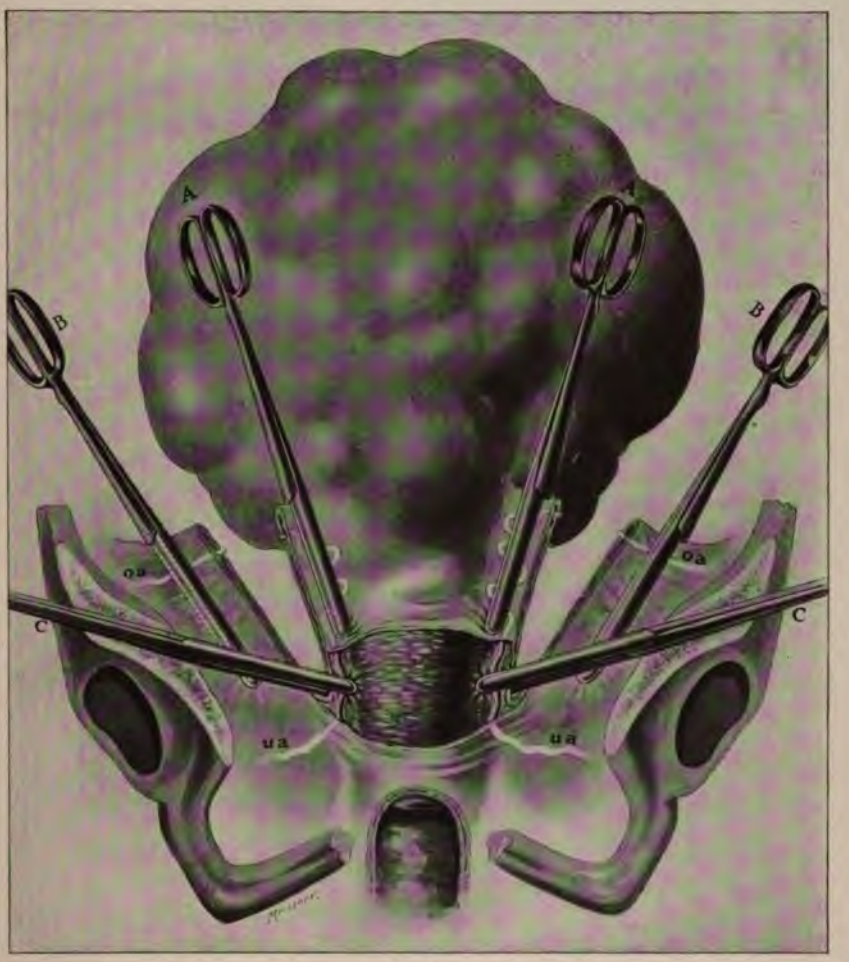
The *technique* of the operation for the removal of a pedunculated fibromyoma is as follows: The tumor is delivered through an incision sufficiently long to admit of this without undue traction. Omental or intestinal adhesions can be dealt with before or after the tumor is delivered from the abdominal cavity, according to the nature of the case. The uterus is carefully inspected and palpated to determine whether or not it contains other tumors, and the tubes and ovaries are also examined. If examination of these organs show that their removal is not necessary, the abdominal cavity is protected by gauze; the peritoneal coat of the pedicle is incised and the peritoneum pushed down as a cuff. The pedicle is now firmly grasped by one or more strong clamps and the tumor enucleated. The vessels of the stump are isolated and ligated separately when possible and the clamps replaced by strong whipping suture ligatures. After it is evident that the hemorrhage is controlled the peritoneal cuff is closed over the stump with a running suture. Catgut and kangaroo tendon are the best suture material to use in the operating, and round needles are preferable to those with cutting edges. The uterus is dropped back into its normal position and the abdomen closed.

Where the pedicle is very short or large a wedge-shaped incision can be made, the vessels caught and ligated, and the edges of the incision closed by interrupted or whipping-suture ligatures.

In many interstitial and non-pedunculated growths it is possible to enucleate the tumor alone. If it is determined that this is indicated the uterus with its tumors is brought well into view and the intestines are kept in the abdominal cavity and protected with gauze. An incision is made over the most prominent portion of the tumor through its capsule, which is pushed back as far as possible. The tumor is now firmly grasped with strong traction forceps and enucleated from its bed by means of a blunt dissector, the handle of the scalpel, fingers, or by torsion. Bleeding vessels are caught and ligated by means of suture-ligatures and the sides of cavity which had been occupied by the tumor firmly adapted by interrupted catgut sutures applied in tiers, mattress or continuous sutures are occasionally used for this purpose. Where the cavity is of considerable size it may be necessary to excise a portion of the uterine tissue and tumor capsule in order to adapt snugly the walls of the tumor-bed without causing too great tension on the sutures. The peritoneal edges of the incision should be accurately adapted by the use of interrupted catgut sutures.

ABDOMINAL HYSTERECTOMY (SUPRAVAGINAL AMPUTATION—HYSTEROMYOMECTOMY).—This is the operation which is most frequently done in the treatment of fibromyomata of the uterus. It is indicated in the radical treatment of all fibromyomata except those which can be readily removed by the vaginal route, or where the abdominal myo-

PLATE XXII.



Supravaginal Hysteromyomectomy.

This figure shows the initial steps of the operation:

1. The broad ligament on each side of the uterus has been clamped by means of two long pressure forceps *A A*, close to the uterus, and *B B* parallel to *A A* and toward the wall of the pelvis. These two forceps secure the ovarian arteries as they run toward the uterus and as they reach the uterus.

2. The broad ligament on either side between the forceps *A A* and *B B* has been divided by means of scissors.

3. The peritoneal investment of the uterus has been divided by a circular incision all around the cervix, on a level a little above the attachment of the bladder. This incision is best made by means of a scalpel or sharp-pointed scissors.

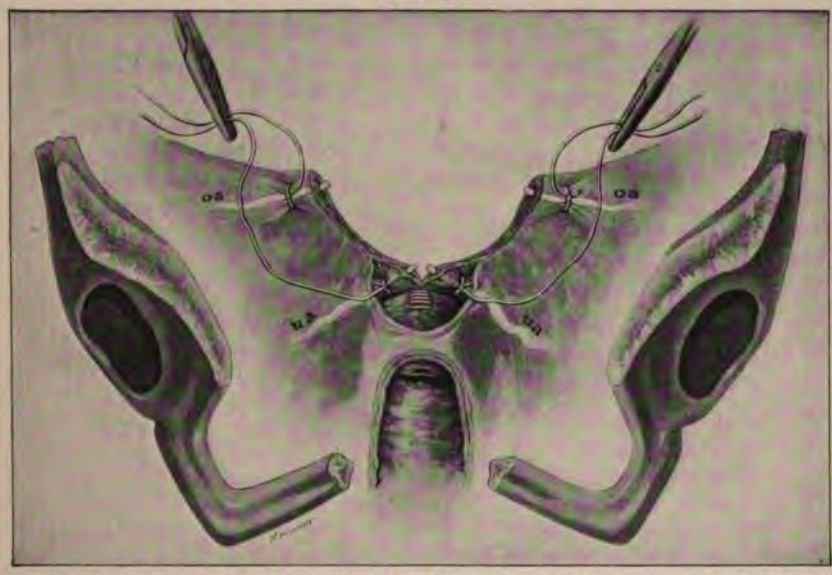
4. The peritoneal investment of the uterus below the circumuterine incision, together with the attached bladder, has been stripped down to the level of the uterine arteries, *u a*, *u a*, so that the uterine arteries are exposed.

5. The uterine arteries as they run upward along the sides of the uterus are clamped by means of forceps, *C C*. (Dudley.)

mectomy or a panhysterectomy is indicated. The objections to the operation are those which can be urged against the removal of the uterus for any disease, and these apply largely to women who still have the expectation of several years of sexual activity. After the menopause it is generally preferable to myomectomy even when the latter can be done as safely.

The operation which will be described or some modification of it is the one generally done at the present time. It has been gradually evolved from the original methods of Péan, Hegar and others where the cervical stump was fixed in the abdominal incision and which is known as the extraperitoneal treatment of the stump. The *technique*

FIG. 210



Supravaginal hysteromyomectomy. Ovarian arteries *o a*, *o a*, and uterine arteries *u a*, *u a*, secured by the ligatures are held in pressure forceps; uterine stump closed by continuous suture in antero-posterior direction. (Dudley.)

of the operation in an uncomplicated case is as follows: An abdominal incision is made sufficiently long to permit the delivery of the tumor from the peritoneal cavity. Adhesions when present dealt with and the condition of the tubes and ovaries investigated. The tumor is delivered from the peritoneal cavity, the patient placed in the Trendelenburg position, and the intestines protected and kept inside the cavity by means of pads or sponges. The tubes and ovaries in each side are exposed and ligatures applied to the ovarian vessels and round ligaments. A clamp is placed just inside these ligatures so as to include the whole length of the broad ligament. Another is applied closer to the uterus in a similar manner and the broad ligament is cut between these clamps to within a short distance of the uterine artery. An incision is next

made through the peritoneum across the anterior face of the uterus sufficiently high to ensure the bladder against injury. This flap is dissected or pushed down to the junction of the cervix with the body of the uterus. A similar flap can be made posteriorly if desired, but it is not necessary. The uterine vessels are caught on each side by strong, curved clamps and the uterus amputated a sufficient distance above the clamps, grasping the uterine arteries to allow these vessels being caught and ligated separately. The cervical stump is caught with a tenaculum forceps and any spurting vessels clamped. One should now proceed to ligate the uterine arteries and check all oozing. The clamps on the broad ligaments and uterine arteries are next replaced by whipping-suture ligatures, thus securing these vessels doubly. The lips of the cervical stump are approximated by a few sutures which should be applied so as to control hemorrhage, and all raw areas covered with peritoneum by a running suture which tucks in the stumps of the ovarian vessels, round ligament, uterine vessels, and cervix. Finally, the abdominal cavity is sponged dry and closed.

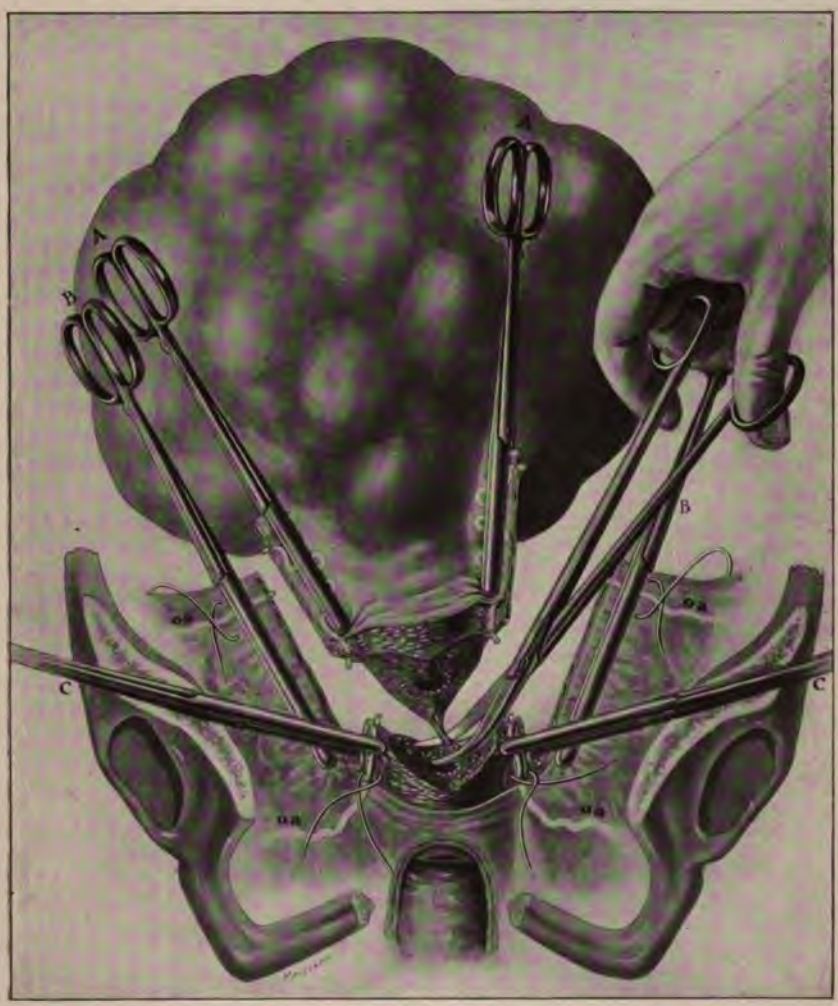
Numerous modifications of the procedure described may become necessary on account of the situation of the tumor, its size, inflammatory conditions of the uterine appendages, etc.

When the tumors are developed largely intraligamentary, or in the lower uterine segment, it frequently happens that the uterus cannot be lifted from the pelvis until the cervix is amputated. In such cases by pulling the tumor to first one side and then the other the principal vessels can, as a rule, be exposed and secured.

Numerous other devices have been used and are occasionally not only useful but necessary for the success of the operation. One of these is the continuous operation from one side of the pelvis to the other as advocated by Pryor, Kelly and others. The cases in which this procedure is indicated are those where either from the development of the tumor, adhesions, etc., the vessels in one side can be secured with readiness, while those on the other side are inaccessible. The steps are as follows: Ligation or clamping the ovarian artery of one side, the round ligament, the uterine artery successively, cutting as these are secured; incising and pushing down vesical peritoneum with bladder; amputation of the cervix, the uterus being pulled forcibly up until the other uterine artery is exposed, which is then clamped and cut. The ovarian artery and round ligament are clamped and cut. The remainder of the operation is as has been described for the usual method.

Another method which is useful when exposure of the vessels is difficult is the bisection of the uterus with its tumors. In this procedure the ovarian vessels are first clamped if this be possible. The uterus is caught by two powerful tenaculum forceps, one on either side of its median plane, and bisected down to the cervix. The halves are enucleated in succession from the centre toward the pelvic wall, catching the large vessels as they are exposed. Unless the tumors are very hemorrhagic less blood is lost by this method than would seem probable, the large sinuses being caught or compressed as the bisection is made.

PLATE XXIII.



Supravaginal Hysteromyomectomy.

Forceps *A A*, *B B*, and *C C*, in place as shown in Plate XXII. Ligatures for permanent hæmostasis of the uterus and ovarian arteries in place, but not tied. Uterus being removed by scissors in such a way that the uterine stump may be sutured in a line from before backward instead of from side to side. (Dudley.)

In this method and the one described immediately preceding one should be careful not to clamp the ureters. The uterine artery can be brought out quite distinctly, as a rule, by forcible traction on the amputated uterus and should be caught about two centimetres above the cervix.

Should the tumor arise from the anterior or posterior face of the uterus the uterine vessels can, at times, be ligated and the uterus amputated before disturbing the tumor in its bed.

PANHYSTERECTOMY (ABDOMINAL TOTAL EXTIRPATION).—The enucleation of the entire uterus is indicated when malignant disease exists in a fibroid uterus in certain cases of infection of the uterus or tumors, and occasionally where it is desired to drain the pelvis by way of the vagina. The operation consumes more time and is attended with a greater loss of blood and a greater liability to injury of the ureters than supravaginal amputation.

The *technique* of the operation is much like that of the supravaginal amputation except that the cervix is removed instead of being amputated. Should there be a malignant growth of the cervix the technique described in the section in carcinoma of the uterus should be carried out. In other cases the following is a rapid and comparatively easy method: Ligation and division of the ovarian vessels, round ligament, and uterine vessels as described under *supravaginal amputation;* separation of the bladder down to the vagina; formation of the posterior flap of peritoneum, and separation of the uterus from the parametrium laterally to the vagina, keeping close to the cervix. The uterus is then pulled forcibly upward and forward and an opening is made into the vagina posteriorly close to the cervix with a finger in the vagina as a guide, a curved clamp is applied to the vaginal wall close to the cervix, and the tissue between this and the cervix cut through, and this procedure is continued until the cervix is entirely separated from the vagina. The clamps are replaced by whipping-suture ligatures, a narrow gauze drain placed in either broad ligament, the vaginal walls partially adapted, the peritoneal flaps brought together, and the abdomen closed.

In cases of gonorrhœal infection of the uterus where this organ is removed for fibromyomata or where free drainage is wished, the supravaginal amputation may first be done. The cervical stump is then caught, pulled up, and cut through posteriorly. The cervical canal, which is thus exposed with a portion of the surrounding tissue, is excised and vaginal drainage secured with little loss of time and no danger of injuring the ureters.

In cases where the tumors are developed largely in the broad ligament or arise from the lower uterine segment it may be necessary to excise the stump after the amputation of the uterus.

Some operators prefer to do a combined operation by beginning in the vagina, entering the peritoneal cavity anteriorly and posteriorly, and separating the cervix laterally until the cervical branch of the uterine artery is ligated. The remainder of the operation is completed from above.

Prognosis of the Radical Treatment of Fibromyomata of the Uterus.—The mortality of the operative treatment of these tumors depends upon the nature of the case and of the operation and upon the skill and experience of the operator. It has materially decreased of late years, due both to the improvement in the technique and to the fact that operative treatment is generally advised at an earlier period than was formerly the case. Cushing, in 1895, gave a collection of 216 cases of abdominal hysterectomy with a mortality of 9.3 per cent., and 266 panhysterectomies with 14.3 per cent. mortality. Olshausen in 1897 in a series of collected cases found a mortality of 5.6 per cent. in 806 cases of supravaginal amputations, and one of 9.6 per cent. in a series of 520 cases of total extirpation of the uterus for fibromyomata. H. A. Kelly in 1898 states that in 100 consecutive cases of abdominal hysterectomies for myomata, including all kinds of complications, he lost 2 cases. Hunner in 1903 reported 100 consecutive cases from the same clinic with 6 deaths. Hirst in 1903 estimates the mortality of the radical treatment of uterine fibromyomata to be about 5 per cent. Pryor, in 1903, states that the mortality of vaginal hysterectomy for fibromyomata is *nil*, for abdominal hysterectomy for myofibroma is 2 per cent., but in "fibrocystic" tumors it is much higher—*i. e.*, 10 per cent.—due to the coexisting heart lesions which frequently accompany "fibrocystic disease."

It is impossible to estimate the mortality of the operations for the removal of fibromyomata of the uterus in exact figures. The following statements seem, however, to be warranted by the facts which we can now command:

1. That in uncomplicated cases the mortality of operations for the removal of uterine fibromyomata should not exceed 2 per cent.

2. That in cases complicated by disease of the heart, bloodvessels, and kidneys; by severe inflammatory processes of the uterine adnexa or pelvic peritoneum; by numerous and dense intestinal adhesions; by the large size, incarceration, intraligamentary development, or tremendous blood supply of the tumor; by carcinoma of the cervix; by necrosis or infection of the tumor, any of the operations are much more dangerous, the mortality depending in a large degree upon the nature of the case.

3. That the vaginal hysterectomy has, as a rule, a lower mortality than abdominal hysterectomy, and the latter a lower mortality than panhysterectomy.

The success of an individual operator will depend largely upon his skill and the care with which he selects his treatment to suit his cases. Careful and repeated observations of his patient, with a view to determine the complications which may be present, and intelligent efforts toward overcoming these both before and during operation, will enable him to materially reduce his mortality. Rest in bed, with regulation of food, bowels, etc., combating anæmia with iron, arsenic, food, and rest; awaiting the subsidence of acute pelvic inflammation, phlebitis, etc.; improving the condition of the kidneys and bladder by appro-

priate measures, and the condition of the heart by rest, strychnine, etc., will enable one to successfully remove a considerable number of tumors which would otherwise not be possible.

Pregnancy and Fibromyomata.—A complication that deserves special attention is the relation of pregnancy to these tumors. The fibroid in the uterus modifies in various ways the course of the pregnancy, and, in turn, the pregnancy modifies the usual history of the fibroid.

When pregnancy occurs in a uterus containing fibromyomata these growths are subjected to the same changes as the rest of the uterine wall. The increased blood supply leads to a more active growth and therefore a more rapid increase in size. The changes in the uterus tend to secure the distinction between the interstitial, subserous, and submucous varieties, the two latter tending to revert to the interstitial condition. Veit describes an instance where the metamorphosis was watched. A distinctly subserous sessile fibroid during pregnancy was so stretched and flattened out that it no longer protruded beyond the surface of the uterus and became apparently fully interstitial. After labor the tumor regained its subserous characteristics and was then operated upon. This change of relations of the fibroid to the uterus seems to be due both to the pressure exerted by the uterine contents upon its wall, and also to the increased tension that arises from stretching the tumor. Again the increased vascularity of the uterus leads to a softening of the fibroid, and in some cases even to an œdema which may simulate a cystic condition. In some of the cases there may be a cystic formation or a hemorrhage into the tumor, which modifies its consistency, and in rare instances there may be a necrosis. With the increased rate of growth there are the increased symptoms of pain due to the stretching of the walls and from compression. The action of the neighboring viscera may be interfered with, exaggerating the disturbances of bladder and rectum more than is usual in the uncomplicated pregnancies. A pedunculated subperitoneal fibroid that has been resting in the true pelvis and causing no symptoms may be raised out of the pelvis and from the chance of freer movement is more liable to become twisted on its pedicle and give rise to the usual train of acute symptoms starting in with the acute pain and ending possibly with peritonitis.

During the puerperal period when the uterus is undergoing involution there is a different set of complications that arise in the tumor. If the fibroid has grown with the pregnancy, when the blood supply is again reduced the fibroid will probably undergo an atrophy which carries it back to its previous size or possibly even to smaller dimensions. A limited number of instances are recorded in which the tumor has so far atrophied after labor that it has been said to have disappeared, but the germs of the abnormal condition are still present and are liable to grow again possibly at the time of the next pregnancy. On the other hand, in some of these instances the growth does not enlarge in the next pregnancy and the woman is apparently freed of her trouble.

A more common sequence in the puerperium is that as the blood

supply is reduced there sets in a necrosis of the tumor. As in the cases where there is no pregnancy complication this necrosis is most liable to occur in the polypoid and submucous masses, but it may happen in subserous or even interstitial tumors.

Again, the tendency of the uterus to throw off the fibroid mass into the peritoneal cavity or into its own canal leads to instances of expulsion of the fibroid into the vagina.

FIG. 211

Incarcerated fibroids of the cervix; child saved by Cæsarean section. *a* and *b* refer to the incarcerated tumors.

Still another complication that is liable to arise from the resistance of the tumor to the uniform contraction of the uterus is the persistent patency of the uterine sinuses with marked bleeding postpartum, a bleeding which is not so easily controlled by stimulation of the fundus, douches, or ergot.

The influence of fibromyomata on the pregnancy brings out several points of interest.

In the first place, pregnancy seems to occur distinctly less often in married women that have these tumors than in married women without them. Hofmeier estimates that 11 per cent. of all married women

PLATE XXIV.

Myomatous Uterus Five Months Pregnant. Twisted pedicle, infection of myoma and consequent peritonitis; hysterectomy; death from nephritis. (Dudley.)

(Specimens furnished by Dr. A. C. Haven.)

are sterile, but that 25 per cent. of the married women that have fibroids are sterile. Veit makes the effect of the fibroid still more marked. He considers that only from 8 to 10 per cent. of married women, as a rule, are sterile, but that 30 per cent. of the married women with fibroids are sterile.

After conception has taken place and the pregnancy has started there arise a number of complications. The irregular shape of the uterine cavity and its irregular blood supply tend to irregularities in the nutrition of the ovum and consequent abortion. Not infrequently, and possibly because the uterine end of the tube is blocked by the encroachment of the fibroid mass, the ovum lodges in the Fallopian tube and there arises an ectopic pregnancy. Again, when the ovum does lodge in the uterine cavity the irregularities in the fundus lead to a low implantation of the ovum and placenta, or even a placenta prævia.

FIG. 212

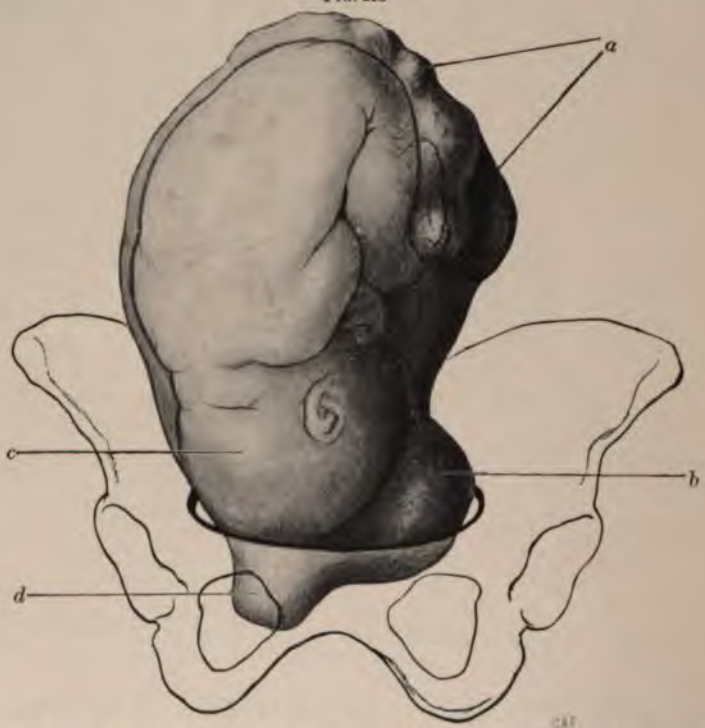
Pregnancy in fibroid uterus, third month: *a*, fibroid nodules in fundus; *b*, fibroid, low, in pelvis; *c*, fetus; *d*, cervix.

As the uterus enlarges with the pregnancy the fibroid at times causes a retroversion of the uterus and a consequent retention of the fundus in the hollow of the sacrum, the condition of incarceration. Rarely, the irregularities of the uterine wall lead to such irregular growth that there is imminent a rupture of the uterus due to the irregular tension on the walls.

At the time of labor we are often surprised to find everything pass off smoothly. But there, too, irregularities are frequent. Instead of the head presentations occurring in 95 per cent. of the cases, as they normally do, Veit finds them in but 54 per cent.; while the breech presentations instead of occurring in but 3 per cent. of the cases are, when the pregnancy is complicated by fibroids, increased to 28 per cent.; and the transverse presentations, instead of occurring in an insignificant ½ per cent. are found in 19 per cent.; so that merely on account

of the presentation of the child, the course of the labor becomes more difficult. But the difficulties are much more increased by the mass of the uterine tumors which tend to fill the pelvic cavity and obstruct the egress of the infant. Pinard collected 84 cases of labor where the pregnancy had been complicated by fibroids. Of these 84 cases, 30 had to be assisted in the labor while the other 54 managed somehow to deliver themselves spontaneously. At times, however, it happens that the woman dies undelivered, though such an occurrence can scarcely be conceived of in these days when surgical help is so accessible. Some cases that seem incredible have, however, been recorded.

FIG. 213



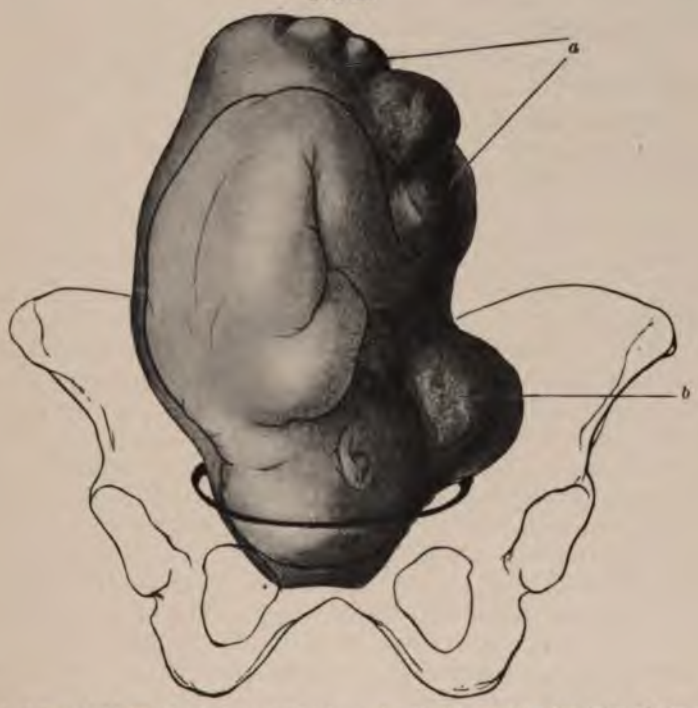
The same uterus at the end of pregnancy; the large fibroid covers the inlet of the pelvis and hinders the entrance of the head. (See Fig. 212.)

Veit notes one case of multiple nodules in the uterus which so filled the pelvic cavity that there remained only 4 or 5 centimetres between the tumor mass and the symphysis. And yet in this instance a living fetus of nine lunar months was delivered spontaneously. There seems to be a very marked softening of the fibroid masses due to œdema and infiltration of the uterine walls at the time when the softening of the cervical tissues becomes most marked.

Diagnosis.—The diagnosis of a fibroid tumor when the pregnancy is known to exist, or of pregnancy when several large tumors are known

to be present is not always easy. The interstitial and submucous fibroid masses are the most difficult to determine, though a subserous fibroid may be mistaken on palpation for a small part or a head, but the mobility of the two is very different. The fetal parts can be depressed into the uterine cavity and cannot be moved to any great extent laterally except with the other parts of the fetus. On the other hand, the subserous fibroid has its movements limited by the length of the pedicle. In the sessile fibroids there may be no movement and under no conditions can the fibroid be depressed into the cavity of the uterus. The rate of growth

FIG. 214



The same uterus during the first stage of labor; the fibroid covering the inlet of the pelvis is drawn up with the dilatation of the cervix and has made room for the advancing head. (Bumm.) (See Fig. 212.)

of the fibroid in comparison to the fetal part of corresponding size is often the most characteristic point in the development of the mass, and repeated examination may be the only sure method of diagnosis. If there are, however, many hard nodules between which the softened uterine tissue can be felt the diagnosis of fibroids and pregnancy can be usually made.

The cessation of the menses as a sign of pregnancy if it occurs in a woman known to have a fibromyoma is of considerable value. But on the other hand the menses may in rare and extreme cases be absent merely as a symptom of a chronic secondary anæmia in the course of the

tumor; and again monthly discharges of blood may continue through a large part of the pregnancy, due to its presence. The palpation of the fetal parts by abdominal examination may be obscured by the tumor masses so as to make this one of the sure signs of pregnancy of difficult elucidation. So, too, the fetal heart sounds may be obscured by the tumor mass to such an extent that they are no longer clear. It may be possible to trace the uterine adnexa to the fundus of the pelvic mass, and such will at least aid in the determination of the question as to whether the whole uterus is symmetrically enlarged or whether the mass is limited to one wall, and this is some aid in the diagnosis, but still many cases are far from clear. Even after the birth of an infant the possibility of a twin remaining in the uterus or the presence of a fibroid tumor may still cause anxiety. The difficulties in determining whether or not these two conditions coexist is so great that much to our chagrin every year in our hospitals and in the hands of our best gynecologists we open uteri that we think to be purely fibroid and find in them perhaps a fibroid and a fetus, perhaps the fetus and no tumor.

Treatment.—The treatment of cases where fibromyomata and pregnancy coexist may be considered as either prophylactic, symptomatic, or directly aimed at the relief of the complication. The prophylactic measure of preventing pregnancy in women who have fibromyomata is one which we may advise in some cases, but seems desirable only in cases where the tumors in themselves are an indication for treatment, and yet where removal of the fibroids at least in part, so that pregnancy will no longer be so dangerous is contraindicated. The more valuable measure as prophylaxis is the removal of the tumor before pregnancy occurs by whatever measure may be indicated in each particular instance. This may at the same time relieve the sterility, one of the symptoms that brings the patient to ask for help, and yet the question arises whether we may not by so increasing the chances of pregnancy put the woman in greater danger than before. The symptoms which call for special treatment when pregnancy has occurred in a fibroid uterus are perhaps most frequently the pressure symptoms due to unusual and irregular filling of the pelvis. The pressure on the rectum with its rectal tenesmus or constipation; the pressure on the urethra, bladder, ureters, giving vesical tenesmus or decreased passage of urine; the overfilling movements of digestion, the undue pressure on liver and diaphragm interfering with breathing or with the action of the heart, may any of them indicate a laparotomy and removal of the tumor or even of the uterus with its contents.

The conditions such as persistent bleeding from the uterus during the pregnancy; abortion, whether threatened or in progress; placenta prævia and ectopic gestation indicate lines of treatment such as are recognized as desirable under normal conditions, and in addition certain modifications indicated by the presence of the tumor. To control the bleeding it is more often necessary than in normal cases to resort to packing the uterus; the threatened abortion can less often be con-

trolled, and after it has occurred more often needs to be followed by curettage and packing. When the abdomen is opened for the treatment of the ectopic pregnancy the opportunity for more radical treatment of the cause of the trouble is open, and if the condition of the patient will stand it future prophylactic measures should be employed.

The torsion of the pedicle of the tumor caused by the elevation of the pedunculated mass out of the pelvis, causing the sharp attacks of pain in the lower part of the abdomen, the collapse and prostration and the following peritonitis give indications for laparotomy and the removal not only of the tumor that is causing the trouble but also any others that may interfere with the pregnancy in labor. The persistently increasing pain in the pelvis due to incarceration of the uterus, and the tendency to abortion may at times be relieved by freeing the uterus under an anæsthetic. In other cases it may be necessary to open the abdomen and release the uterus by direct manipulation, and in such cases the advisability of more radical treatment will arise. If, however, there is no evident source of danger it may seem preferable to let the pregnancy run its course undisturbed, while in other cases the tumor or the entire uterus may need to be removed. In rare cases collapse and internal hemorrhage from rupture of the uterus may call for immediate hysterectomy.

The general condition of the woman, too, at times adds a most important indication for the treatment of the pregnancy. If the effects of the secondary anæmia are sufficient to have produced degenerations in the heart muscle and in the kidneys they may make the continuation of the pregnancy extremely dangerous. Fortunately, pregnancy occurs less often in these run-down conditions.

At the time of labor the abnormal presentations indicate treatment as in the cases not complicated by fibroids. If there is *dystocia* due to the presence of the fibroid masses, no matter what the presentation, it is in itself the chief indication for treatment. It is this obstruction to the birth of the child that is the complication most commonly thought of which adds danger to the pregnancies in these fibroid cases. If we can foresee this complication it may be possible to avoid it. If the fibroid is subserous or possibly interstitial and caught below the brim of the pelvis and can be pushed up into the abdominal cavity, perhaps raising the whole uterus with it, such a reposition should be made. Such manipulations should be undertaken late enough so that when the mass has once been reduced it will not again sink into the pelvis, preferably, therefore, in the last two months of the pregnancy. It should be attempted first without anæsthesia, and if that is unsuccessful, again with anæsthesia. When the uterus has once been lifted out of the pelvis measures should be taken to prevent the return to the previous position.

The manipulations necessary for reposition are peculiar to each case, so that no general laws can be laid down for their use. The combined bimanual manipulations, elevating with the vaginal hand and holding all ground gained with the abdominal hand twisting the uterus

on its long axis, or as the condition suggests, is about all that can be described. At times, rectal manipulations may serve where vaginal have been unsuccessful. In some instances even a laparotomy may be advisable to aid in the reposition. It is almost superfluous to add that the manipulations should be undertaken only after emptying the rectum by enema and the bladder by catheter. When the mass cannot be reduced without undue force some other method of treatment should be considered, and if on several occasions reposition fails some other line of treatment should be adopted. If reposition has been successful the uterus should be retained in the abdomen by an abdominal bandage, vaginal tampon, or some other means which the case may suggest.

In some of the submucous fibroids it may be feasible to remove them, as they tend to become extruded in the course of the pregnancy. Polypi can frequently be removed, and at times an enucleation from the cervix is possible during pregnancy, but usually masses that are small enough to be removed in this way would be passed by the child. Mundé, however, in one case removed in this manner a fibroid weighing three pounds. It seems desirable, too, in these cases to postpone the removal of the mass until shortly before the time of expected labor, as undoubtedly such operations do tend to induce uterine contractions, and there is little to be gained by earlier operation. However, it is possible to operate and have the wound healed before labor that certainly saves the chance of infection from the lochial discharge that must bathe the wound, and this is the main factor that must be weighed against the chance of premature delivery.

The induction of labor prematurely to avoid the later complication has not much in its favor. In the early three months it may be used to advantage, but after that the mortality to both mother and infant is high. Veit quotes 9 cases of late induction of labor where 67 per cent. of the mothers were lost, and though only 56 per cent. of the children were lost at the time, more probably died owing to the difficulties in rearing the premature infants.

Version in Veit's series of 87 cases lost 61 per cent. of the mothers and 82 per cent. of the children, which is certainly not much better than the induction of premature labor.

The forceps seemed to give the best results in Veit's series of 39 cases. Here only 33 per cent. of the mothers and the same number of the infants were lost.

Perforation was done in 17 cases, losing 47 per cent. of the mothers (more than the forceps), and, of course, all of the infants.

Turning to the abdomina operations in treatment of these cases, in the earlier months myomectomy and enucleation may be tried if the child is living, and supravaginal amputation or panhysterectomy if the child is dead. At term a Cæsarean section or Porro operation is indicated.

Veit quotes 28 cases of myomectomy, losing 5 of the mothers (18 per cent.) and followed by abortion in 3 of the cases (10 per cent.).

He gives 23 cases of enucleation with only 1 death of the mother (4 per cent.), but eight abortions (35 per cent.).

The supravaginal amputations in 45 cases lost 8 mothers (18 per cent.), and in 6 cases of panhysterectomy lost 3 of the mothers (50 per cent.). At term the Cæsarean section in 20 cases had 12 fatalities (60 per cent.), and the Porro operation in 48 cases had 16 fatalities (33 per cent.). So that it would seem that if an operation is necessary enucleation should be the choice during the course of the pregnancy and the Porro operation at or immediately preceding term.

Thumin[1] has given some more recent statistics that seem more in accord with what we should expect. In 89 cases of supravaginal amputation there were 10 deaths (11 per cent.), 1 due to pneumonia, 2 to intestinal paresis, and the other 7 to peritonitis or sepsis. In 56 cases of total extirpation of the uterus there were 5 deaths (9 per cent.), 1 from sepsis, 1 from ileus, 1 of vagus paralysis, 1 of pulmonary embolism, and 1 of collapse. In 49 cases of Cæsarean section followed by supravaginal amputation 6 women and 9 children were lost. Of the women (12.5 per cent. mortality) 1 died of ileus, 1 of suicide, and 1 of eclampsia. Of the children (20 per cent. mortality) 2 were stillborn, 2 died in a few hours after birth, and 2 before they were six months old. In 14 Cæsarean sections followed by total extirpation of the uterus 1 woman died of exhaustion and 1 child was born dead.

The statistics in these cases are based on the very limited number of cases, 322 in all, and yet they may be taken as certainly suggestive of what we may expect. The operations have in all these cases the dangers of hemorrhage aggravated by the coexistence of two conditions, either one of which markedly increases the blood supply to the uterus, this is especially true of the fibroids, for it is only in the cases of large fibroids that interference with the pregnancy is indicated. In addition to this in the Cæsarean section we have the additional disadvantage that we must open the uterine cavity not at the point of election, but where the fibroid masses leave us the best point of entrance, and this may make the operation much more awkward than the typical Cæsarean section. We may comfort ourselves, however, with the fact that a great many of the cases that seem impossible to deliver either spontaneously or with help, do so soften that when labor sets in the child is most unexpectedly born without interference. Nearly two-thirds of the series of cases collected by Pinard were delivered without aid. The skull of a dead fetus is of course easily moulded to pass great obstructions, but Veit cites a case of multiple fibroid nodules in the uterus so filling the pelvis as to leave out 4 or 5 cm. between their mass and the symphysis pubis. And yet through this narrowed opening passed an infant of nine lunar months, spontaneously and living.

Even after the child has been born the dangers of the woman are not ended. Not infrequently the placenta is more than normally adherent, and sometimes it cannot be removed with less than operative

[1] Archiv. f. Gynäkol. 1901, vol. lxiv. p. 518.

measures. Traction on the cord naturally tends markedly to increase the chances of inversion of the uterus and ill-managed expression is almost as disastrous. Manual removal of the placenta is at times impossible, and curettage or even hysterectomy has to be resorted to.

Later, during the puerperium necrosis of the fibroid mass may set in, giving rise to symptoms suspicious of sepsis or sapræmia; here, again, if the drainage through the cervix is not adequate operation must be considered either for drainage or for the removal of the necrotic portion of the uterus.

Thus we see the pregnancy a most serious complication for the woman with fibroids, and also the fibroid hanging like a cloud over the entire period connected with pregnancy, from the time before conception, when the fibroid brings to the woman the despondency due to sterility, till the end of labor and the puerperium and the uterus has again returned to its previous condition; we see the dangers of pregnancy added to the dangers of the fibroid, and new dangers arising out of the combination of the two, and yet we find a large proportion of the cases coming through as sound as they began, and a few improved by the subsequent atrophy of the fibroid.

CHAPTER XVII.

MALIGNANT TUMORS OF THE UTERUS.

By G. BROWN MILLER, M.D.

CARCINOMA, SARCOMA, ENDOTHELIOMA, AND SYNCYTIOMA OF THE UTERUS.

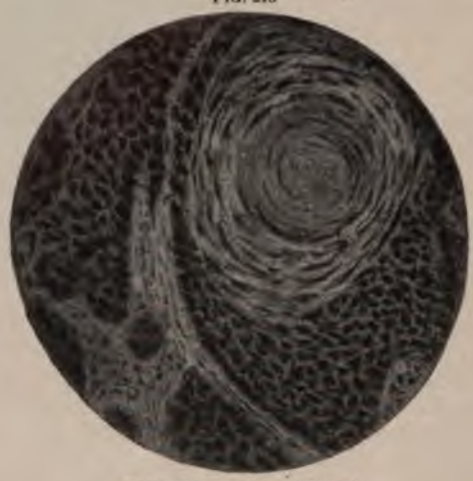
The varieties of malignant new-growths of the uterus are generally given as four—viz., carcinoma, sarcoma, endothelioma, and syncytioma.

Carcinoma.—By carcinoma of the uterus is meant a malignant new-growth of definite alveolar structure which has its origin in the epithelial cells of the uterine mucosa. The uterus is the most common seat of cancer and the cervix is affected about four times as often as the body of the uterus. The two *varieties* of uterine carcinoma are the *squamous*-cell and the *adeno*-carcinoma. There are two kinds of epithelium forming the external layer of the mucous membrane of the uterus—viz., the squamous cells, covering the vaginal portion of the cervix and extending a little inside the external os, and the cylindrical cells, lining the uterine glands and forming the superficial layer of the mucosa of the remainder of the uterus. In the great majority of cases the two forms of carcinoma take their origin respectively from these two varieties of cells. It is held by Winter and others that the adenocarcinoma takes its origin *always* from the glands of the cervix and body of uterus, while the squamous-cell variety is never derived from the glands, but always from the surface epithelium. Cullen believes that the adenocarcinoma may arise from either the surface or glandular epithelium. In nearly all cases the squamous-cell carcinoma begins in the squamous-cell mucous membrane of the cervix, but it has been seen occasionally arising from the surface epithelium of the body of the uterus and of the cervix above the upper limit of the squamous-cell mucous membrane.

Squamous-cell Carcinoma.—This, as above stated, arises always from squamous cells. The lower layers of cells begin to proliferate and form finger-like processes which are made up of masses of epithelial cells. These invade the surrounding tissues in various directions and extend likewise externally. The processes above mentioned are seen on histological examination to be made up of epithelial cells of varying size and shape, which are generally arranged in layers on each other. At times the cells are arranged concentrically, forming onion-like, ovoid bodies, the *epithelial pearls* (Fig. 215), while again no definite arrangement of the cells can be made out except that they lie closely packed together. As the epithelial cells proliferate there is likewise a proliferation of the stroma, although to a much less degree. The finger-like

processes seen in the cauliflower carcinoma of the cervix consist usually of central bloodvessels with a small amount of connective-tissue stroma and covered with many layers of squamous epithelial cells. At times the epithelium is not thickened in these processes which project exteriorly (Fig. 217). To the contrary, these outgrowths may have lost

FIG. 215



Epithelial pearls. (Winter.)

the covering layers of epithelium and the tips of the processes may be entirely denuded. In the later stages, while the extension is increasing into the surrounding tissue, these finger-like projections break down and an ulcerated condition finally results. As the masses of cells invade

FIG. 216

Squamous-cell carcinoma of the uterus. (Winter.)

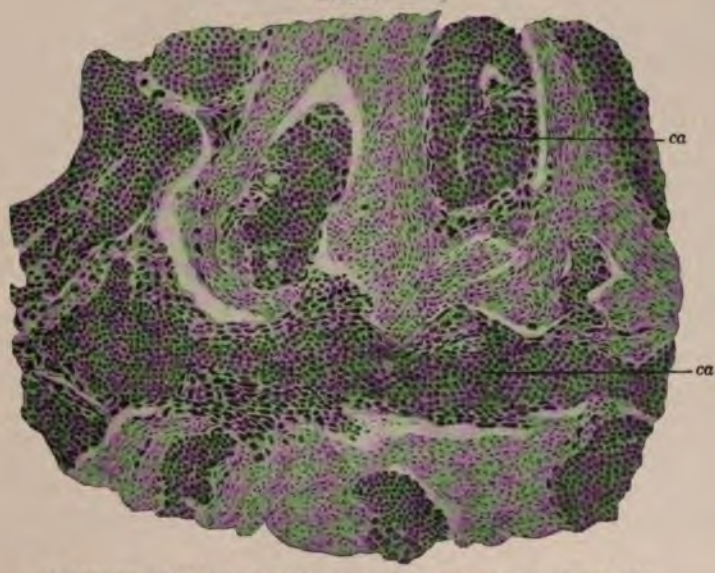
the surrounding tissue, either from the irritation produced by the invading growth or from an infection from the broken-down parts of the cancer, there results an inflammatory condition around the invading cancer, as is shown by an infiltration of the tissue with small round cells

and polymorphonuclear leukocytes, and an increased vascularity. The centre of the mass of cells frequently shows spaces which resemble the lumen of glands, these spaces being the result of the degeneration of the central portions of the process.

The microscopic appearance of squamous-cell carcinoma is then as follows:

Finger-like processes made up of masses of epithelial cells which invade the surrounding tissue and project externally; in the latter situation they are often broken down. The cells of the processes are epithelial in type but show great variety in size and form, while their nuclei show great variation in the intensity with which they stain, masses of chromatin being seen in some. The cells show, as a rule,

FIG. 217



On the border of a finger-like process. *ca*, carcinoma cells. (Kundrat.)

rapid cell division, as is indicated by many nuclear figures. The invading carcinoma is preceded by a zone of inflammatory reaction.

Adenocarcinoma.—This form of carcinoma is regarded by many as having its origin *only* in the cylindrical cells lining the glands of the cervix and body of the uterus. Cullen believes that it may arise from either the surface or glandular epithelium. Two forms are described. The *first* resembles in many cases squamous-cell carcinoma. The cylindrical cells covering the surface of the mucosa and lining the glands become lower, more cuboidal in form, and in places several layers are seen lying on each other. The proliferation continues, and in places the lumen of the glands become filled with solid masses of cells. The membrana propria is broken through and the surrounding tissue is

invaded by the growth. Papillary outgrowths of cells into the uterine cavity are likewise seen. While in places the growth resembles squamous-cell carcinoma, yet the distinct glands which can be seen in places and the character of the cells indicate the variety of the carcinoma. One sees also variations in shape, size, and intensity of staining of the cells, and likewise increased cell division.

The second variety of adenocarcinoma is called by Rüge *adenoma malignum*, and the name is significant of the type of the new-growth. In it the gland lumen is not filled with masses of cells in layers and the

FIG. 218

Carcinoma adenomatosum. (Ruge.)

cells retain their cylindrical form. The cells, as a rule, retain their characteristics so well that one can tell whether the growth has its origin in the body or cervix of the uterus. The glands lined by their single layer of cells multiply and hypertrophy and are seen lying packed closely together and penetrating deeply into the tissue. They form also papillary outgrowths into the uterine canal (Fig. 218). The epithelial cells show variations in size, form, and intensity of staining. Increased cell division is generally noted and the surrounding area of round-cell infiltration is, as a rule, present. This form of carcinoma is rare.

PLATE XXVI.

Combination of Squamous-cell Carcinoma and Adenocarcinoma of the Corpus Uteri. (Findley.)

From the foregoing it is seen that carcinoma of the *cervix* can be conveniently divided into two forms, namely: (*a*) *Squamous-cell carcinoma* arising, as a rule, from the surface of the vaginal portion of the cervix, and (*b*) *adenocarcinoma* which has its origin in the cylindrical epithelium of the cervix. Carcinoma of the *body* of the uterus is, as a rule, an adenocarcinoma, although a few instances of squamous-cell carcinoma has been observed in the body. These have probably arisen from surface epithelium which had undergone hyperplasia through some irritation, and which has the character of squamous epithelium.

The relative frequency of the varieties of carcinoma of the uterus is shown by Cullen's statistics, where in 176 cases there were 123 of squamous-cell and 18 of adenocarcinoma of the cervix, and 35 of adenocarcinoma of the corpus uteri.

Etiology of Carcinoma.—Practically nothing is known of the specific cause of carcinoma. Many theories have been advanced and none of them have as yet been proven. The belief which is now generally accepted is the view held by Hansemann, Hauser and others, that cancer is primarily a disease of the epithelium, but as to the causes of the cell alteration nothing is known. The parasitic theory has many advocates, but most of the more competent observers are opposed to it. Practically nothing has been proven in its behalf, but it offers a seductive field for further investigation. While nothing is known as to the specific cause of the new-growth, trauma bears an undoubted causal relation to carcinoma. Thus, cancer of the cervix is rarely found in women who have not been pregnant or upon whom some operation upon the cervix has not been performed. Cullen states: "In 50 of our cases of squamous-cell carcinoma of the cervix in which accurate data were available, 49 (98 per cent.) had had children, while 17 of the 50 had miscarried. Out of 14 cases of adenocarcinoma of the cervix in which definite data were obtainable, 12 of the patients were married and had had children; 2 were single." These statements coincide with the view of almost every observer. The relation between carcinoma of the body and trauma is nothing like so striking.

Heredity has apparently little or no causal relation to cancer of the uterus, although some cases would seem to show it.

The influence of age upon the development of cancer is very striking. Squamous-cell carcinoma usually develops after the twenty-fifth year and is much more common about the menopause. Practically the same statement holds good for adenocarcinoma of the cervix. In adenocarcinoma of the body of the uterus the age of the patients averages higher than in either form of carcinoma of the cervix.

The Ways of Extension of Carcinoma of the Uterus.—The ways by which carcinoma of the uterus extends to other structures are (1) by direct invasion, (2) by the lymphatics, (3) by bloodvessels, and (4) by implantation.

Squamous-cell carcinoma of the cervix shows a decided tendency to spread along the vaginal wall. It does this not, as a rule, through lymph or bloodvessels, but by the neighboring parts of the mucosa undergoing

carcinomatous degeneration, or by the masses of carcinoma cells invading by direct growth the adjoining tissue, possibly along preformed spaces in the submucosa. The vaginal walls may also be involved by metastases or by contact with contiguous cancerous tissue. The connective tissue of the pelvis is generally invaded later than the vagina. This invasion takes place both by the direct growth of the carcinoma into it and by metastases through the lymph channels. The iliac, lumbar, and inguinal glands are frequently involved. Metastases, at times, occur in various portions of the body through the bloodvessels.

In adenocarcinoma of the cervix the way of extension is essentially different, in that the tissue usually first involved is the surrounding connective tissue and not the vaginal mucosa. Consequently we see first involved the surrounding cervix; next, the structures outside of this, as the septum between the uterus and bladder, the parametrium, etc.; and later, as a rule, the mucosa of the vagina or vaginal portion of the cervix. This form of carcinoma may likewise spread along the lymph-vessels or blood-vessels or by implantation.

Carcinoma of the *body* of the uterus extends to other structures later than is the case in carcinoma of the cervix. If it is situated low in the corpus it may extend to the cervix and to the connective tissue of the broad ligament fairly early. It generally extends comparatively slowly through to the uterine muscle and then invades the overlying peritoneum, but may likewise be spread by way of the lymph-vessels and blood-vessels.

Symptomatology.—The symptoms which carcinoma of the uterus gives rise to vary in the different stages of the disease and to some extent in the different forms and situations of the new-growth. The principal symptoms are hemorrhage, leucorrhœa, cachexia, loss of strength, pain, urinary and bowel and uræmic and septic symptoms. Unfortunately for the patients suffering from the malady in the early stages of the disease and at times even after it has extended beyond the hope of relief, the symptoms are either insignificant or entirely wanting.

Hemorrhage is one of the earliest and is the most important symptom in the *diagnosis* of carcinoma and frequently likewise in the palliative *treatment* in inoperable cases of the disease. The hemorrhage in the early stage of carcinoma may take the form either of profuse and frequent menstruation or more frequently a blood-stained vaginal discharge noticed especially after sexual intercourse, douching, or exercise. The characteristics of the hemorrhage depend largely upon the situation of the growth. In cancer of the vaginal portion of the cervix the hemorrhage is generally noticed fairly early in the disease and is usually seen after sexual intercourse or after a vaginal douche. The hemorrhage is due to an abrasion of the superficial portion of the carcinoma, especially the finger-like outgrowths. As stated before, each of these contains a bloodvessel, and when it is abraded there is hemorrhage. The increased vascularity of the tissue causes the hemorrhage to be more profuse than it would otherwise be. When the growth is in the cervical canal or the body of the uterus the first thing noticed

may be an increased and, at times, painful menstrual flow, if the patient has not passed the menopause. These are due both to the increased vascularity and an effort of the uterus to expel the growth where the papillary outgrowth extends into the uterine canal. As a rule, in carcinoma of the cervical canal, hemorrhage only takes place after the superficial parts of the carcinoma have broken down, and this is generally rather late in the course of the disease. In carcinoma of the body the hemorrhage may take the form of increased and painful menstruation, and later there is a continuous flow or blood-stained leucorrhœa.

In most cases the hemorrhage is at first slight and the patient pays little attention to it, but later when deep ulceration and wide extension of the cancer involve the larger bloodvessels it is frequently alarming and the patient may bleed to death. In the majority of the cases it does not directly end the life of the sufferer, but by lowering her vitality hastens the end by making her more susceptible to infection, producing anæmia, etc.

The amount of hemorrhage varies greatly in individual cases. In the *less* vascular form of the disease the hemorrhage may be slight or none at all until late, while in the *more* vascular forms it may be profuse even in the early stages. The importance of hemorrhage as a diagnostic symptom cannot be overestimated. In women who have not passed the menopause a variety of conditions may cause it, but when this symptom occurs in women after this period in life the most probable cause is cancer. It is so necessary to operate early in carcinoma cases that it is the duty of every physician to investigate thoroughly the cause of uterine hemorrhage in every woman who consults him for this symptom and to impress upon the laity the meaning of this symptom in women who have passed the menopause.

LEUCORRHŒA.—One of the first symptoms noted is an increased vaginal discharge. This at first may have the appearance of an ordinary leucorrhœa, but later it takes the form of a thin, watery discharge which sooner or later contains more or less blood. With the necrosis and breaking down of the carcinoma the discharge frequently has an offensive odor and assumes a brownish color. This odor is due to the decomposition of the broken-down cancer tissue and blood clot caused by the action of putrefactive bacteria. There is nothing characteristic in the odor, as it is the same which accompanies putrefaction in retained placenta, necrotic intrauterine tumors, etc.

CACHEXIA.—This symptom usually develops late in the course of the disease. The skin assumes a yellowish or grayish-white color, due to loss of blood, anorexia, failure in general health, uræmia, and the absorption of the products of decomposition. The last-named cause is a potent factor, as is shown by the improvement in the appearance of the patient when absorption is prevented by the removal of the masses of cancer and keeping the parts free from decomposition by vaginal douching or antiseptic vaginal tampons. The disgusting odor likewise tends to take away the patient's appetite and thus cause failure in general health.

Emaciation, Loss of Strength, etc.—Sooner or later in the course of the disease as a result of hemorrhage, sepsis, etc., there is a loss of strength and failure in the health of the patient.

Pain.—When the disease has progressed beyond the uterus and has involved the parametrium, bladder, ureters, rectum, etc., pain assumes a prominent feature in the symptomatology of the disease. It usually occurs late and is consequently of value in determining the advisability of radical operations. After its appearance, as a rule, operation offers little hope for cure. The pain is caused by pressure of the masses of carcinoma upon the nerves of the pelvis, by involving the bladder and ureters and rectum, and obstruction to the flow of urine to the bladder from the kidneys. In carcinoma of the body of the uterus the pains at times assume the expulsive type caused by the uterus trying to rid itself of carcinomatous masses and blood clots. The pain in the later stages usually becomes so intense that it is necessary to relieve it by means of narcotics.

Urinary Symptoms.—In squamous-cell carcinoma of the cervix the bladder is involved, as a rule, comparatively early, and consequently one sees frequent micturition, vesical tenesmus, and at times cystitis. In carcinoma of the body the bladder is not usually involved, and in adenocarcinoma of the cervix the bladder involvement occurs later than involvement of the ureters. The involvement of the lower portions of the ureters causes hydroureter and hydronephrosis, and, as a consequence, nephritis and uræmia. The ureters are often tremendously dilated. Uræmia is usually a late symptom and is a frequent immediate cause of death. In the late stages, one at times sees vesicovaginal fistula due to the destruction of the bladder wall.

Bowel Symptoms.—The rectum is involved late in the disease, as a rule, but, at times, we see the invasion of the rectal wall by carcinoma and occasionally a rectovaginal fistula as a result of such an invasion. In carcinoma of the body of the uterus the disease may extend through the uterine walls involving the peritoneum and later the intestines, causing symptoms of obstruction, ascites, etc. By metastases the retroperitoneal tissues may become involved and intestinal symptoms arise.

Sapræmic and Septic Symptoms.—As stated previously, with the breaking down of the carcinomatous masses decomposition frequently occurs and the symptoms of sapræmia arise. Generally late in the disease streptococci, staphylococci, and other septic micro-organisms may gain access to the growth and as a consequence septicæmia and pyæmia may develop. The high mortality after operations for carcinoma of the uterus is largely due to the presence of pyogenetic bacteria and the subsequent infection. Even in the palliative operations the patient at times dies from infection.

Summary.—The symptoms of carcinoma of the uterus may be summarized as follows:

At first there is generally an increased leucorrhœal discharge. This becomes blood-stained, or an occasional hemorrhage may occur after sexual intercourse, douching, or unusual exercise. The leucorrhœa

changes into a thin, watery flow which later assumes a muddy or brown color and frequently has an offensive odor. The hemorrhage may become marked. The patient loses in strength and weight and becomes cachectic. Pain in the pelvis, back, and loins develops and frequent micturition and vesical tenesmus may arise. Gradually the patient suffers from constipation due generally to the small ingestion of food and to narcotics. Uræmia, septic intoxication or infection may now appear and vesicovaginal or rectovaginal fistula be seen. The patient usually dies of uræmia, infection, or hemorrhage.

Diagnosis.—The diagnosis in cancer of the uterus is made by means of the patient's history, by vaginal and rectal examination, by curettage, and the use of the microscope.

HISTORY.—This is important, but the reader is referred to the preceding text on *symptoms*.

VAGINAL EXAMINATION.—This is the most important means which we have of diagnosing carcinoma. The condition found on examination differs considerably in different forms of cancer and it is considered desirable to describe them separately.

In the very early stages of *squamous-cell carcinoma of the cervix* one finds on examination a roughening, enlargement, and induration of the involved cervical lip. On inspection the mucous membrane presents a nodular appearance, nodules appearing bluish-white in color. Small papilla may be made out in places and the tissue may bleed somewhat on being disturbed by the examining finger. In such an early stage one must depend upon microscopic examination for a certain diagnosis. At a little later stage one may find the cauliflower form of carcinoma of the cervix. The examining finger finds a mushroom-like mass filling more or less of the upper vaginal vault and springing from the cervix (Fig. 219). The growth is usually from one lip of the cervix. It gives to the finger the sensation of a cauliflower, breaks down and bleeds readily, and small masses of the cancer can usually be detached during the palpation. These are rather firm in consistency and have a whitish or pale-red color. When the finger is guided between the vaginal wall and the growth the latter is found to be attached to a lip of the cervix by a pedicle-like base and a sharp line of demarcation can be made out between the involved portion of the cervix and the surrounding softer tissues. The palpating finger can likewise detect the cervical canal and the other cervical lip. Sometimes the vaginal vault seems to be entirely filled by the excrescence, but in these cases a careful palpation can detect the origin of the growth from the cervix. At times the growth occupies both lips of the cervix, but this is rare. By means of the speculum one can see the cauliflower-like excrescence with its bleeding points and small masses of the broken-down tissue. The examination by the rectum is of value in these cases, as one can by this means not only feel the cancer mass but its attachment to the cervix and note its extension into the surrounding tissues.

It is important to note that in cancer the pedicled growth springs from the superficial portion of the cervix and does not protrude from

the cervical canal, as is the case with mucous and submucous fibroid polypi.

With the disintegration of the cancerous tissue, in the early stages, we find on examination an ulcerated area involving more or less of the cervix. The margins of the ulcer are hard, indurated, and irregular, and the surface bleeds freely on the slightest manipulation. Still later

FIG. 219

Squamous-cell carcinoma of the cervix; cauliflower-like mass springing from the anterior lip. (⅘ natural size.) As can be seen from the relative positions of the tubes and ovaries, the uterus has been opened posteriorly. Arising from the anterior lip is a large cauliflower-like mass. Its basal attachment is sharply defined and the growth consists of myriads of delicate projections having rounded knob-like structures. There has been only slight breaking down of the cervix. The uterus is normal in size, and its mucosa is of the usual appearance. Both the tubes and ovaries are normal. The uterine arteries have been dissected out, ties off near their points of origin, and removed with the uterus. (Cullen.)

we may find a crater-like excavation occupying the position of the cervix and an indurated, elevated margin to the cancerous growth. Again, we may find an extension involvement of the vaginal wall with comparatively slight breaking down of the new-growth. Isolated nodules may be felt beneath the vaginal mucosa at some distance from the margin of the body of the growth. Late in the disease the parametrium is like-

FIG. 220

Squamous-cell carcinoma of the cervix with extension to the bladder and rectum. Vesicovaginal fistula. (Natural size.) The picture represents a sagittal section of the bladder, uterus, and rectum. The cervical landmarks are entirely obliterated. The upper part of the vagina and the greater portion of the body of the uterus are occupied by a new-growth. At the cervical site the growth is broken down, presenting a coarsely granular appearance. Its upper limit is irregular, but sharply defined, standing out clearly from the uterine muscle, which is much darker in color. The growth along the lower or vaginal limit is considerably elevated, and overhangs the normal mucosa. Anteriorly the carcinoma has implicated the inner surface of the bladder. Here it measures over one centimetre in thickness, and extends downward to the inner urethral orifice. At the trigonum the bladder has broken down, and there is accordingly a vesicovaginal fistula 1.5 centimetres in diameter and with very ragged margins. A short distance within the inner urethral orifice is a little mound with an opening in its centre. This represents the mouth of the ureter, which opens on a hillock of carcinomatous tissue. It is exceptional to find the bladder as large as in this case, when a vesicovaginal fistula exists, since the viscus naturally becomes much contracted from lack of the usual distention. (Cullen.)

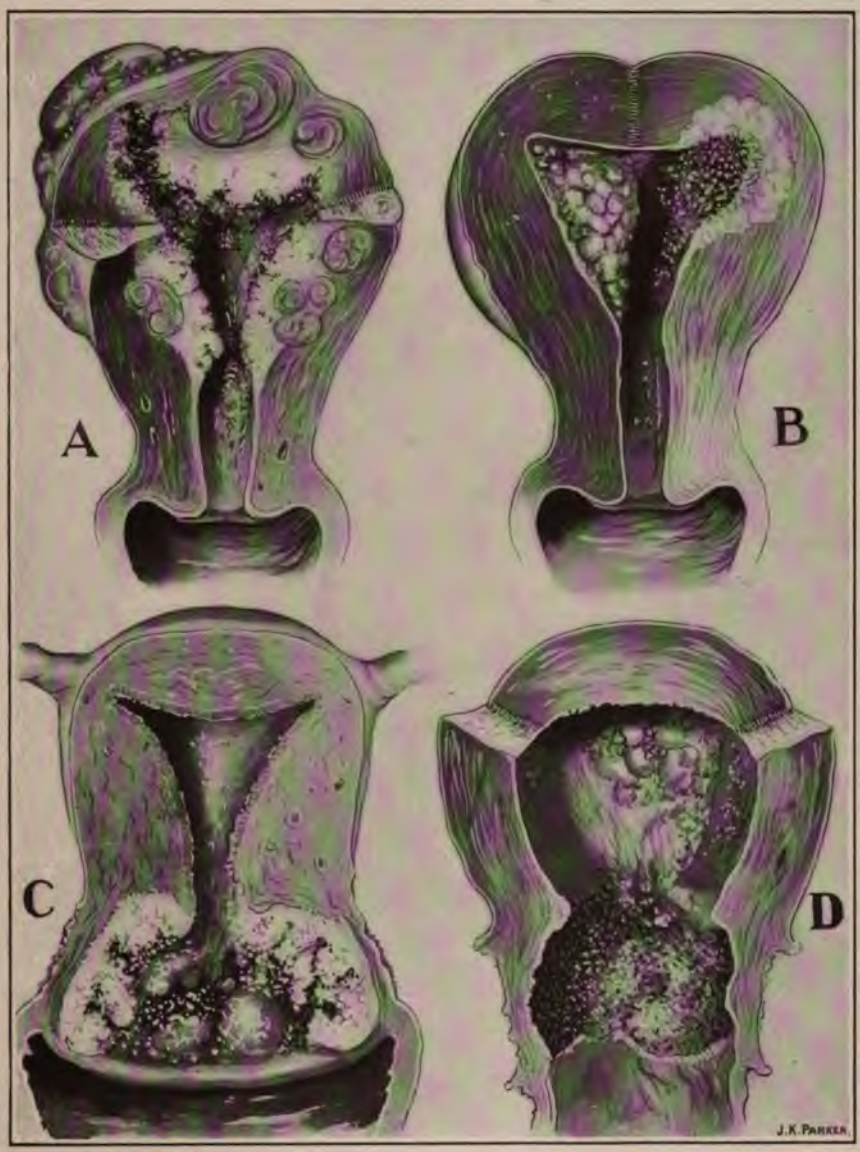
wise involved and has a board-like hardness, while the uterus is almost immovably fixed in the pelvis (Fig. 220). Vesicovaginal and recto-vaginal fistula are sometimes found late in the disease and can be readily detected when of appreciable size.

FIG. 221

Adenocarcinoma of the cervix. (Natural size.) The uterus is opened anteriorly. The cervix is considerably enlarged, but its contour is well preserved. To the right, in the picture, there is slight loss of substance in the tissue at the external os. At this point short finger-like processes are seen springing from the surface. Occupying the anterior wall just within the external os, continuous with the finger-like processes, and extending laterally to within a short distance of the broad ligament attachment, is a new-growth contrasting sharply with the normal tissue. The advancing margin of the growth, both along the cervical mucosa and in the substance of the cervix, is irregular. On the left side a section of the cervix has been removed, and the mode of extension is well shown, the processes of the growth penetrating into the healthy tissues, as the roots of a tree into the soil. (For the histological picture of the growth at 1 see Fig. 222). The body of the uterus is slightly enlarged, its walls are of the usual thickness, but there is an increase of the bloodvessels throughout the muscle, great numbers being seen on cross-section projecting slightly from the surface. The arborescent appearance in the upper part of the cervix is well preserved. The endometrium is normal. Vaginal examination would have failed to give any adequate idea of the extent of the growth. (Cullen.)

In the early stages of *adenocarcinoma of the cervix* the vaginal portion of the cervix may seem almost normal both to palpation and inspection. The only thing to be made out is perhaps an increase in the size and a firmer consistency of the cervix. When the cavity is of considerable size the cervix is soft and easily indented. These signs give us little of value in making a diagnosis. One can, however, usually cause bleeding by pressure on the cervix and a sound introduced in its canal may detect

PLATE XXVII.



A. Carcinoma of the corpus uteri complicated with small multiple myomata.

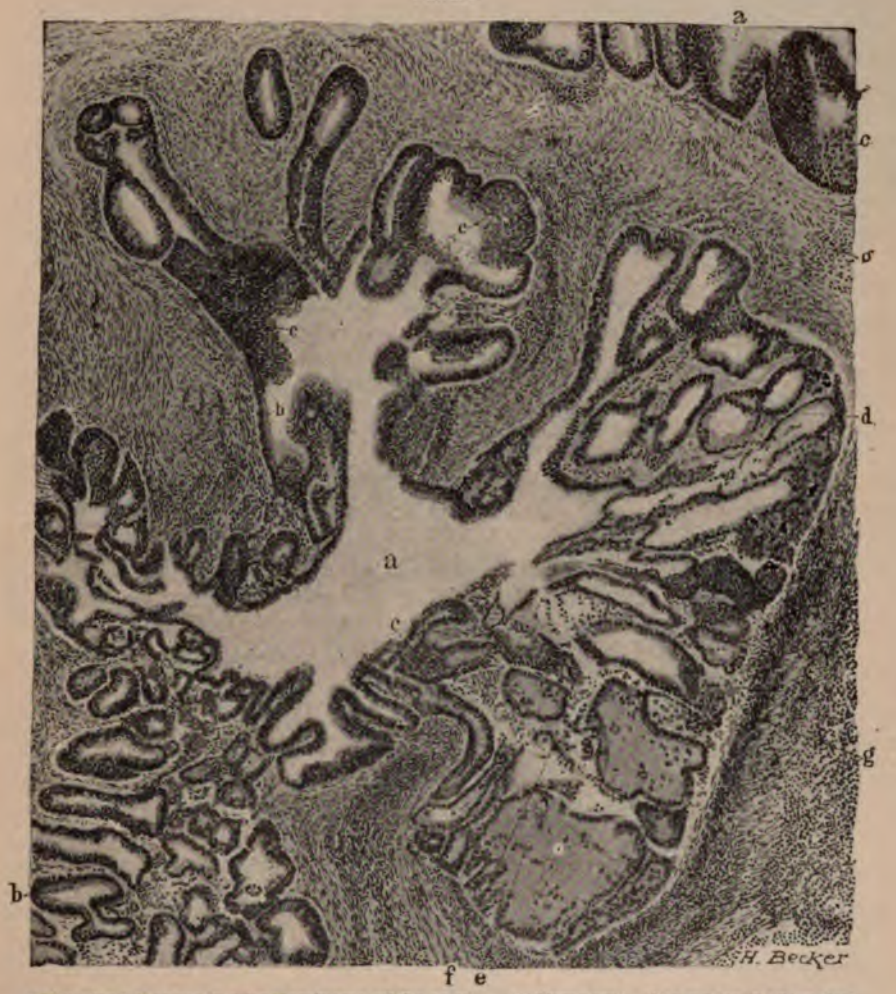
B. Carcinoma of the corpus uteri. On the right side the disease has extended nearly through the uterine wall; on the left side the disease is confined apparently to the mucosa, and in gross appearance resembles polypoid endometritis.

C. Carcinoma of the cervix uteri, the cervix nearly destroyed.

D. Carcinoma of the cervix uteri, the cervix wholly destroyed. (Dudley.)

the excavation caused by the cancer (Figs. 221 and 222). Later, both on palpation and inspection, one can readily detect an excavated ulcer

FIG. 222



Early gland changes in adenocarcinoma of the cervix. (90 diameters.) The section is taken from Fig. 221 at 1. *a* is a greatly enlarged and convoluted gland with many small glands opening into it. These vary considerably in size and shape. Some, cut lengthwise, show the manner in which they empty into the central lumen; at *b* the characteristic high cylindrical cervical epithelium is still preserved; but at *c* there is much thickening, due in part to obliquity of the section, but in many places to undoubted cell proliferation. In numerous places, even where the gland is small, the epithelium is cuboidal or almost flat, as is well seen at *d;* at only one point (*f*) an enlarged and deeply staining nucleus is seen. Some of the glands are dilated and filled with mucus. Scattered throughout them are desquamated and swollen epithelial cells, as well as some small round cells, as seen at *e*. It will be noted that the stroma between the young glands is very scanty, and in some parts hardly appears at all. The cervical tissue in the upper part of the field shows only slight small round-cell infiltration; at *g g* large numbers of small round cells are present. From this section alone a diagnosis of adenocarcinoma would not be justifiable, but a reference to the text will show that in the older portions of the growth the typical picture was present. (Cullen.)

in the cervical canal with its ragged outlines. Later still, there is a deep crater-like excavation and the vaginal and rectal palpation shows the induration due to the extension of the cancer into the surrounding tissues.

In all forms of cancer of the cervix the microscopic examination of curetted or excised pieces of the growth will show the nature of the disease, and in the early stages this method of diagnosis is of the utmost importance.

ADENOCARCINOMA OF THE BODY OF THE UTERUS.—In these cases the diagnosis cannot usually be established by pelvic examination. The examination may in fact be entirely negative except that we usually find hemorrhage from the cervical canal. One here depends upon the history of the case, which gives indication for curettement where the carcinomatous material *may* at times be diagnosed by the unaided eye (Fig. 223). The carcinomatous masses are usually friable, whitish in color, and firmer in consistency than normal mucous membrane. In the early stages we must depend upon the microscope for our diagnosis. Too much stress cannot be laid upon the microscopic examination of the curetting in suspected cases, for the surgeon who removes the uterus in every case of suspected cancer will occasionally sacrifice the life of his patient unnecessarily, and he who operates only when the curettings present the gross appearance of cancer will allow some cases to escape detection.

In the later stages of cancer of the uterine body the uterus is larger and softer than normal.

In any form of cancer one occasionally sees hæmatometra due to the damming back of blood by an obstruction in the cervical canal. *Pyometra* or a collection of pus in the uterine cavity is occasionally seen.

With the infection of the cancerous area the inguinal glands become enlarged and occasionally they are the seat of metastases. One can, at times, detect enlarged retroperitoneal glands in the pelvis by rectal examination.

Differential Diagnosis.—Carcinoma of the cervix may be confounded with ectropion, erosions, simple abrasions, enlarged Nabothian follicles, syphilis, mucous polypi, submucous myoma, sarcoma, or tuberculosis.

In *ectropion* the everted cervical mucosa can be readily seen. It is bright red in color, does not break down and bleed so readily as cancer and usually gives a history that dates from a labor.

In *erosion* there is an actual ulcer which with the inflammatory exudate around it may bear a strong resemblance to carcinoma. Here the microscope must decide the diagnosis.

The simple *ulcers* and *abrasions* due to *prolapsus* or to other causes present a punched-out appearance, with irregular outlines are usually multiple, and their bases present the typical appearance of granulation tissue. There is little or no induration and the ulcers are usually shallow.

In old *lacerations* and *hypertrophy* of the cervix the hypertrophy and increased hardness of the cervix are the only points of resemblance to carcinoma.

To one of considerable experience the enlarged *cervical glands* (Nabothian follicles) bear little resemblance to cancer, but to the inexperienced the two are sometimes confounded. The Nabothian follicles are usually separate and distinct, translucent in appearance, and on being punctured a glairy fluid will escape.

FIG. 223

Adenocarcinoma of the body of the uterus. (Natural size.) The uterus is twice its normal size, and has been opened anteriorly. The upper part of the cervix is present; its mucosa appears to be normal. The mucosa of the body of the uterus over a limited area is smooth, of the normal thickness, and shows no change. Occupying the anterior wall, however, on the left side, is a new-growth, which near the internal os is recognized as delicate or knob-like processes springing from the mucosa. On passing upward the growth becomes thicker and more compact, but we still have these little outgrowths covering the surface. In the upper part of the cavity the growth reaches nearly two centimetres in thickness, and in some places is very smooth, as at 1. Here the surface is entirely necrotic. The carcinoma has invaded the uterine wall to some extent, and its light appearance stands out in marked contrast to the darker uterine muscle. In such a case we now remove the entire uterus, and would not for a moment consider the question of amputation, even at the vaginal vault. (Cullen.)

Syphilitic ulceration may be mistaken for carcinoma. I have recently seen a woman where the cervix and vagina were the seat of extensive ulceration. There was a foul-smelling discharge which added to the resemblance to cancer. It was a tertiary lesion of syphilis. Chancre may simulate an early stage of cancer, but can usually be differentiated by

its more indolent appearance and by getting well rapidly. Papillary ulcers may be mistaken for cancer. They are usually multiple, covered with whitish or yellow deposit, and are usually accompanied with papules which have not broken down. The history of syphilis, the secondary symptoms, and the prompt response to antisyphilitic treatment will in all cases serve to distinguish syphilis from cancer.

Mucous polypi can be readily distinguished from cancer, as a rule, by being attached inside of the cervical canal, by the absence of papillomatous outgrowths in them, and by their not breaking down and bleeding readily on manipulation.

Polypoid submucous myomata present little resemblance to cancer of the cervix. They are seen protruding from the cervical canal, are usually firm and smooth, and do not bleed readily on manipulation. In both mucous polypi and submucous myoma the cervical mucosa is usually found to be intact.

Sarcoma of the cervix is rare, the most common form being the "grape-like" sarcoma of the cervix. It bears a slight resemblance to the cauliflower form of carcinoma of the cervix. The picture presented in this disease is a mass of oval or yellowish semitransparent cysts resembling a cluster of grapes. In other forms of sarcoma of the cervix a microscopic examination will indicate the nature of the growth.

Tuberculous ulceration of the cervix is a rare condition, but when encountered may be readily mistaken for carcinoma. The ulcer is usually a well-defined one extending from the external os, with undermined edges. Miliary tubercles may be in the vicinity of the ulcer. It is associated in perhaps all cases with tuberculosis elsewhere, especially of the uterine cavity or the Fallopian tubes. The microscopic examination of a small piece of excised tissue will render the diagnosis certain.

Granular vaginitis affects the vaginal portion of the cervix and the vagina. It is not ulcerated and there is little infiltration of the infected tissue. The microscope will here render the diagnosis certain.

Condylomata of the cervix are extremely rare. There is a papillomatous growth, the surface of which is not ulcerated, and there is little infiltration and the intervening mucous membrane is healthy. In doubtful cases the microscope is our arbiter.

The Differential Diagnosis in Carcinoma of the Corpus Uteri.—The conditions liable to be confounded with carcinoma of the body of the uterus are polypi or polypoid endometritis, submucous myoma, sarcoma, retained secundines, threatened abortion, extrauterine pregnancy, tuberculosis of the endometrium. In cases of retained secundines the history of the case and the tissue obtained by means of the curette will render the diagnosis clear. In ectopic pregnancy the history and the pelvic examination will, as a rule, enable one to make a correct diagnosis. In threatened abortion there is usually the history and signs of pregnancy. In both the uterus may be enlarged and softer than normal. Without a clear history of pregnancy and with a bloody discharge lasting a considerable time it is justifiable to curette the uterine cavity when the diagnosis can be made clear.

Explanation of Plate XXVIII.

A. Vaginal hysterectomy. The patient in the dorsal position.

The vagina and cervix uteri are exposed by retractors in the hands of assistants.

The os uteri externum has been closed by a continuous suture, to protect the operation wound and the peritoneum from the uterine secretions.

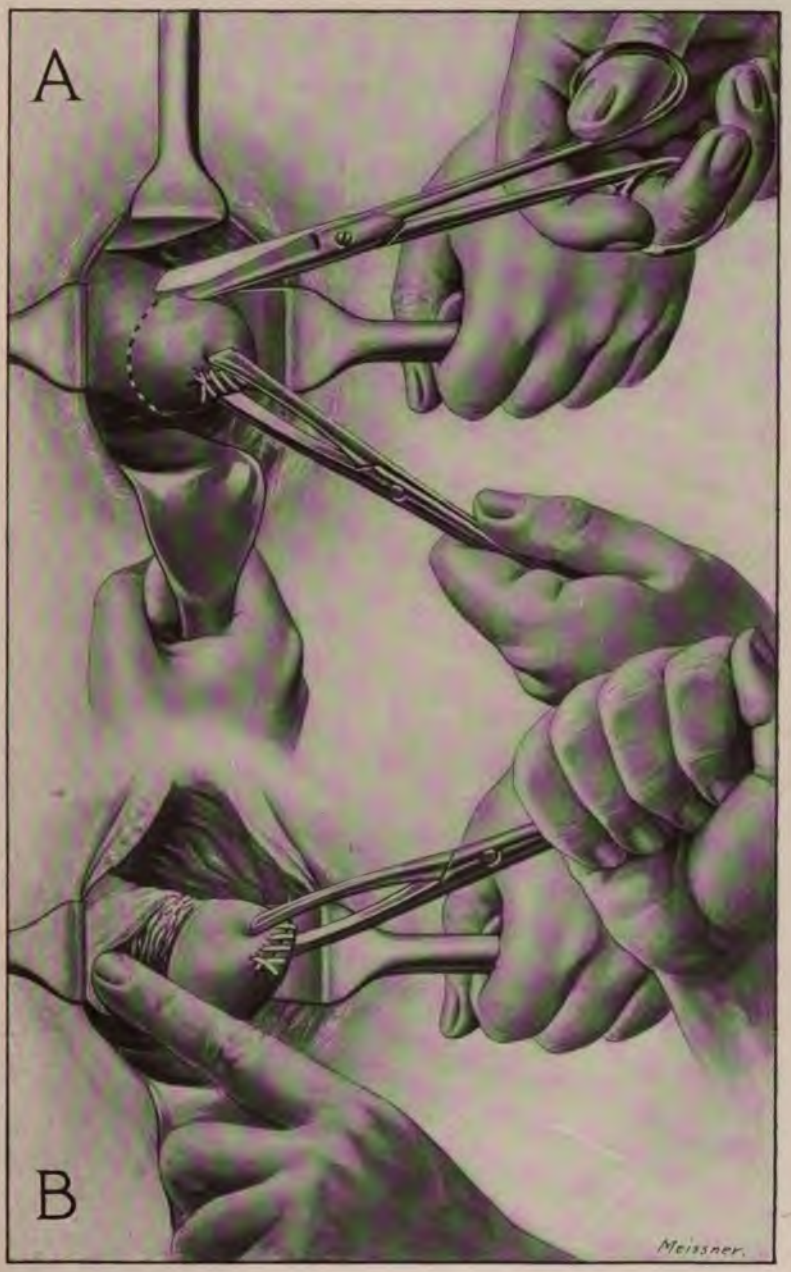
The cervix uteri has been seized by strong flat vulsellum forceps in the left hand of the operator and drawn strongly down toward the vulva.

The operator, with scissors in his right hand, is making a free incision through the mucosa all around the cervix uteri in the line of the utero-vaginal attachment. The black and white dotted lines indicate the direction of the incision.

The bleeding points are secured by fine catgut ligatures—not shown.

B. The mucosa all around the uterus has been divided by scissors. While strong traction is being made on the uterus by the forceps in the right hand of the operator, the left index finger is used to strip back the circumuterine tissue all around the cervix. The stripping process is continued until it has exposed a zone of raw tissue an inch or more wide, when the utero-peritoneal reflexion will be recognized by the loose, thin, membranous character of the tissue, and by the fact that under the finger it slips over the adjacent peritoneal covering of the uterus. (Dudley.)

PLATE XXVIII.



Explanation of Plate XXIX.

Vaginal Hysterectomy. The patient is in the dorsal position.

The vagina and cervix uteri are exposed by retractors in the hands of assistants.

The os uteri externum has been closed by a continuous suture to protect the operation wound and the peritoneum from uterine secretions.

The cervix uteri has been seized by strong flat vulsellum forceps in the left hand of the operator and drawn strongly down toward the vulva.

A. The circumuterine structures have been stripped down to the utero-peritoneal fold, as shown in Plate XXVIII; the operator seizes this fold posterior to the uterus with a hæmostatic forceps in the left hand, and with scissors in the right hand cuts through into the cul-de-sac of Douglas.

B. The operator, with the index fingers inserted into the cul-de-sac of Douglas through the opening shown in *A*, is tearing laterally to the region of the broad ligaments.

A similar incision is then made into the pelvic cavity anterior to the uterus, and enlarged by lateral tearing to the region of the broad ligaments in the manner described above, so that the uterus is attached to its surroundings by only the broad ligaments. (Dudley.)

PLATE XXIX.

Explanation of Plate XXX.

Vaginal Hysterectomy. The patient is in the dorsal position.

The vagina and cervix uteri are exposed by retractors in the hands of assistants.

The os uteri externum has been closed by a continuous suture to protect the operation wound and the peritoneum from the uterine secretions.

The cervix uteri has been seized by strong flat vulsellum forceps in the left hand of the operator and drawn strongly down toward the vulva.

The uterus has been freed from its surroundings anteriorly and posteriorly as described in Plates XXVIII and XXIX.

A. While the uterus is drawn strongly downward and to one side with vulsellum forceps in the hand of an assistant, the operator introduces the left index finger through the posterior vaginal opening in the cul-de-sac of Douglas and brings the finger-tip out into the vagina through the anterior opening, so as to hook it over the left broad ligament; the ligament thus held on the finger is transfixed at two points by a threaded needle passed blunt end first, so that the ligature shall include the entire ligament except the upper and lower borders. A needle passed in this manner is a convenient substitute for the needle with the eye in the point shown in *D*.

B. The needle has been drawn through the broad ligament, leaving the ligature in place ready to be tied.

C. The ligature has been tightly tied and is being secured against possible slipping by an additional stitch on the proximal side of it; the entire ligature when tied is shown in Plate XXXI, *A*. Observe that the ligature does not compress the entire ligament, but leaves out a margin on the upper and lower border, so that collateral circulation may continue to supply and keep alive the distal portion of the stump; this prevents gangrene and sloughing of the stump, and is therefore *a very essential feature of the operation.*

D. shows the form of needle in general use for ligature of the broad ligament. The device of an ordinary needle passed by a needle-forceps, blunt end first, is more simple, and because any size, curve, or form of needle may be used at a constantly varying angle to the forceps, is more practical. (Dudley.)

PLATE XXX.

Explanation of Plate XXXI.

Vaginal Hysterectomy. The patient is in the dorsal position.

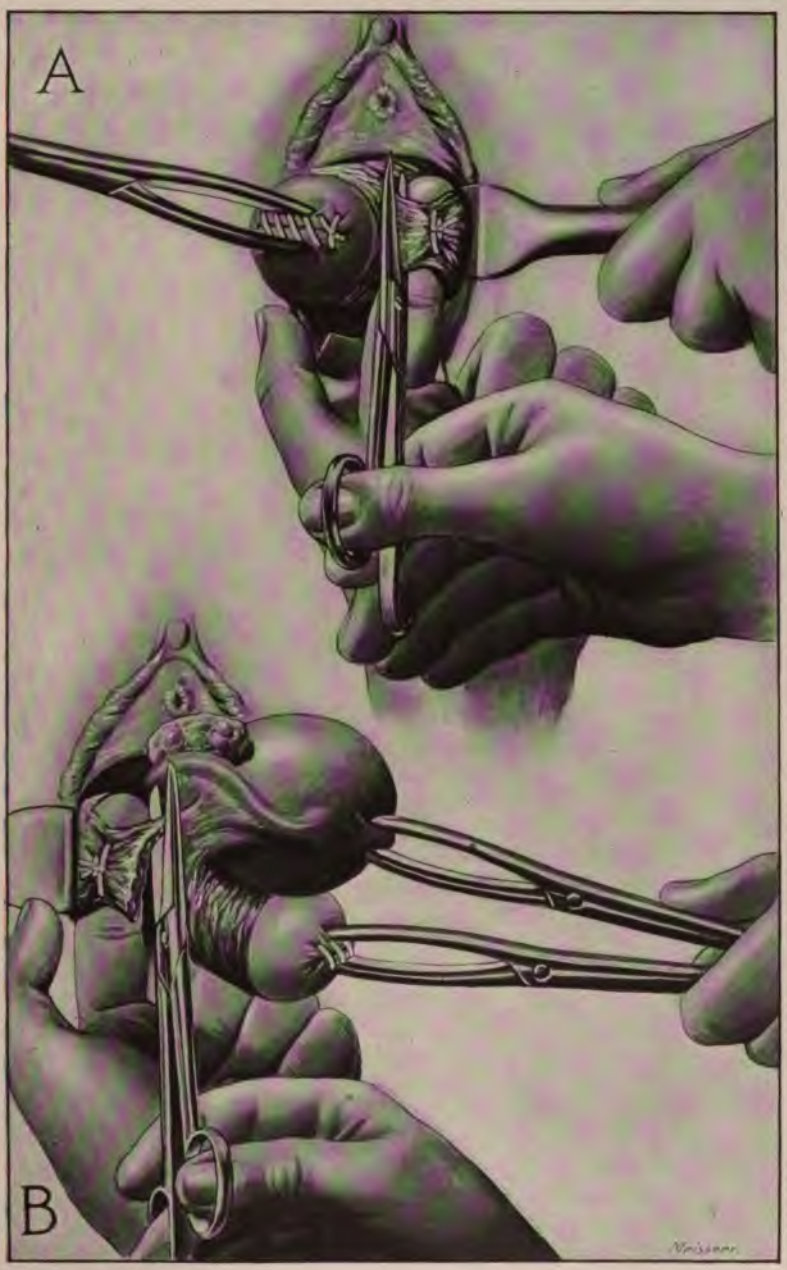
The vagina and cervix uteri are exposed by retractors in the hands of assistants.

The os uteri externum has been closed by a continuous suture to protect the operation wound and the peritoneum from the uterine secretions.

A. The cervix uteri is drawn strongly downward and to one side by vulsellum forceps in the hand of an assistant; the left broad ligament having been ligatured en masse as shown in Plate XXX, is exposed by the operator's left finger and is cut from the uterus about one-half inch from the ligature with scissors in the operator's right hand.

B. The uterus having been freed fromits attachment anteriorly, posteriorly, and on the left is drawn outside, and the corpus is seized with another pair of forceps; these forceps, together with those on the cervix, are placed in the hand of an assistant, who makes traction on them, thus pulling the doubled uterus strongly downward and to one side, while the operator ligatures en masse and severs the right broad ligament in a manner precisely similar to that already described for tying and cutting the left: the uterus having thus been removed, the vaginal wound is closed by interrupted or running catgut sutures, as shown in Plate XXXIII. These sutures may secure both the peritoneal and vaginal margins of the wound or only the peritoneal margins; in either case they should so include the ligatured stumps of the broad ligaments as to fix them in the wound where they may give normal support to the rectum, vagina, and bladder. If drainage is required, the wound should be left partially or wholly open for that purpose. The central third of the wound, if not sutured, will usually suffice for drainage. The gauze drain is commonly preferred. (Dudley.)

PLATE XXXI.



Explanation of Plate XXXII.

In the majority of cases it is impracticable to include the entire broad ligament in a single ligature, and it is necessary therefore to tie it in parts; this is called progressive ligature of the broad ligament.

A shows the broad ligament being progressively tied from the lower to the upper margin; the first ligature is being introduced on the lower margin. As each ligature is introduced, the ligatured portion is cut until the entire ligament is severed from the uterus.

B. In some cases the ligament is too inaccessible for progressive ligature from the lower to the upper margin; then the corpus uteri may be delivered through the anterior vaginal wound and drawn by strong forceps to the vulva, so as to twist the ligament on itself and thereby reduce the size of it and render it accessible for progressive ligature from the upper to the lower border; the beginning of such a ligature is here shown.

C. In some cases the ligaments are inaccessible for ligature in the manners described under *A* and *B*. The uterus may then be seized by two strong forceps, one on either side of the cervix, drawn strongly toward the vulva, bisected with scissors in the median line of the longitudinal axis, and each half drawn outside; the ligaments may then be ligatured and the uterus thus removed in two parts. Resection of the uterus should be avoided when possible, for it exposes the wound to infection from the endometrium. (Dudley.)

PLATE XXXII.

Explanation of Plate XXXIII.

In most cases the ligatured stumps of the broad ligaments can be drawn down into the vagina. In such cases the usual method has been to fasten them by sutures at each end of the closed vaginal wound, in such a way that the ligatured stumps shall be in the vagina below the level of the vaginal wound. The ligatures are applied by many operators *en masse* around the entire ligaments in such a way that the ligatured portion will slough. It is sometimes possible to apply ligatures so that no sloughing can occur; that is, to let the ligatures include only that portion of the ligament through which the arteries pass. This plate shows a very practical method of treating the ligatured ends of the broad ligaments in such a manner as to avoid sloughing of the ligatured stumps and to fix them in the vaginal wound. The method here illustrated is applicable only to those cases in which the ligaments are sufficiently long to permit either end-to-end approximation or the folding of one upon the other and the fixation of them in the vaginal wound between the vaginal and peritoneal sides of it.

A. The ligaments having been ligatured *en masse* in such a manner as to avoid sloughing of the ligatured stumps, are drawn down into the vagina by means of pressure-forceps. The anterior peritoneal margin of the vaginal wound is being united to the posterior margin by a continuous catgut suture. At both ends of the line of union this continuous suture secures the broad ligaments, so that they cannot slip back into the pelvic cavity. Only one ligature is here shown on each broad ligament. In the majority of cases more than one ligature may be required.

B. The anterior and posterior peritoneal margins having been united, as shown in *A*, the broad ligaments are brought together by end-to-end approximation and united by a continuous catgut suture. The united ends of the broad ligaments are now in contact with, and in front of, the united peritoneal margins, shown in *A*.

C. The anterior and posterior margins of the peritoneal wound have been united, and the broad ligaments have been approximated end-to-end by continuous sutures, as shown in *A* and *B*. The anterior and posterior margins of the vaginal mucosa are being united by a continuous catgut suture, making a line of union from side to side. This suture completes the operation.

D. In some cases the broad ligaments are so long that instead of uniting them end-to-end they may be folded one upon the other, and so fastened together. The anterior and posterior peritoneal margins have been united in precisely the same manner, as shown in *A*.

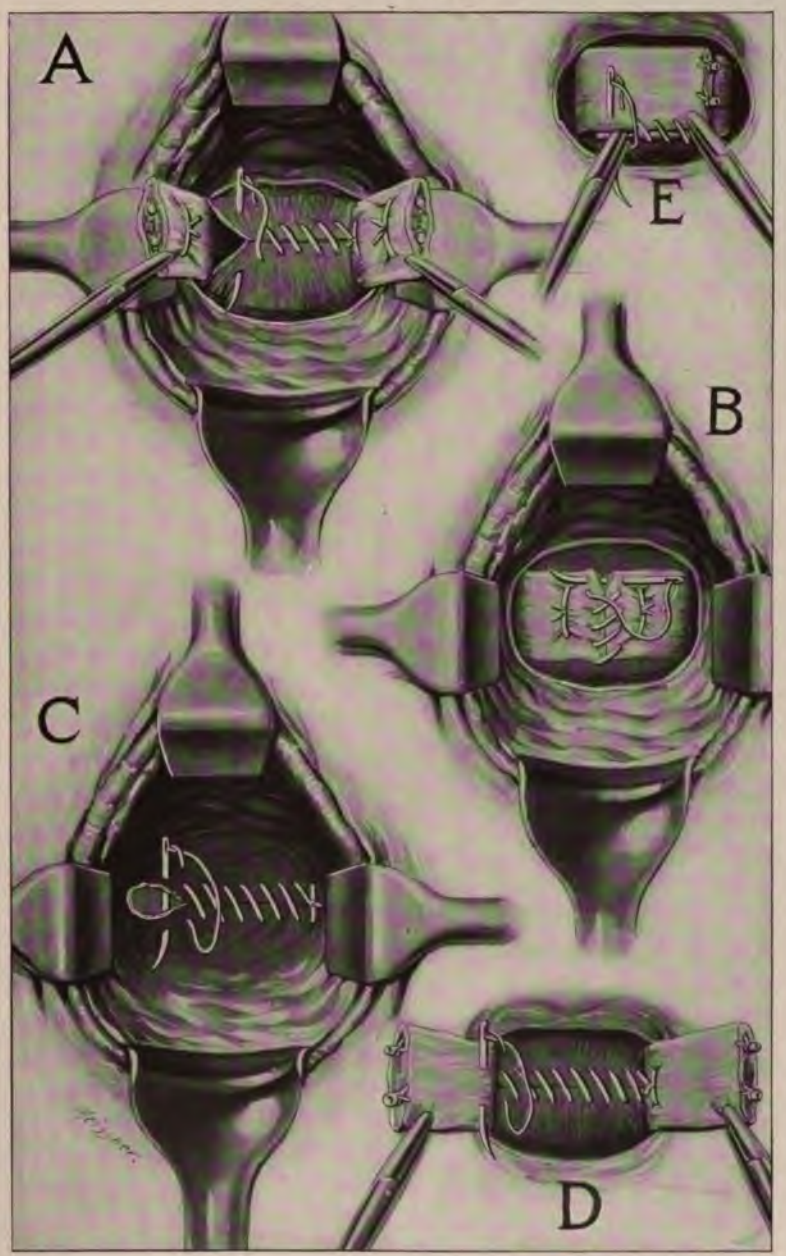
E. The anterior and posterior peritoneal margins of the vaginal wound have been united by a transverse line of union, as shown in *A* and *D*. The ends of the broad ligaments have been folded upon themselves, and are being united by a continuous catgut suture along the lower borders of them. A similar suture is to be introduced along the upper borders. The ligaments having thus been united, are to be covered by union of the upper and lower margins of the vaginal mucosa, as shown in *C*.

The method of fixing the ends of the broad ligaments between the peritoneal and vaginal sides of the wound will be found, when practicable, to have great value, for the ligaments so fixed can then perform the important function of holding the pelvic viscera high up in the pelvis and of preventing prolapse of the pelvic floor (rectum, vagina, and bladder), a not uncommon and most unfortunate result of vaginal hysterectomy when performed by the older methods.

In vaginal hysterectomy for carcinoma the broad ligaments usually will be sufficiently long to permit end-to-end approximation, but, in most cases, they will not permit overlapping, as illustrated in *D* and *E*. The method of overlapping the ligaments, however, will always be possible in the operation of vaginal hysterectomy when performed for complete procidentia uteri, and is strongly urged in that class of cases; when the ligaments are not sufficiently long for end-to-end approximation, they may be fixed in the vaginal wound, as described in the text, or if not sufficiently long for this, may have to be returned to the pelvic cavity. See close of Chapter XLV.

Observe in *E* and *D* the isolated ligature of the arteries. This form of ligature will usually be quite practicable, except for very short and very large ligaments, and when practicable should always be employed, because it insures normal circulation in the stumps and is an absolute safeguard against sloughing. It should, however, be remembered that in hysterectomy for cancer there is a decided advantage in removing as much of the ligament as possible; hence, the ligature *en masse* in such cases may be preferable. (Dudley.)

PLATE XXXIII.



In *polypi* or *polypoid endometritis* it is usually necessary to curette and examine the uterine cavity digitally in order to establish the diagnosis. In myoma the uterus is irregularly enlarged except in cases of submucous myoma. One should remember that cancer and myoma may occur together. Except in cases of submucous myomata, which can be readily enucleated, the diagnosis of carcinoma in the same patient is not so important, as the uterus should be, as a rule, removed for either condition. In like manner, from a clinical standpoint, it is not so important to differentiate sarcoma of the uterus from carcinoma, as in each a radical operation is demanded.

In *tuberculosis* of the endometrium the microscope is necessary to make the diagnosis of this condition. In the early stages of cancer the macroscopic examination would not suffice to distinguish the two diseases; later the caseous material in tuberculosis would not resemble carcinomatous tissue.

In all cases where the diagnosis is not perfectly clear the pathologist's report is essential in establishing it. When feasible the cervix should be so dilated that the finger can be inserted into the uterine cavity by means of which valuable information can usually be obtained.

Treatment.—The treatment of carcinoma of the uterus depends chiefly upon the amount of extension of the growth. After extensive involvement of structures surrounding the uterus the treatment resolves itself into purely palliative measures. In the earlier stages the accepted mode of treatment to-day consists in the removal of the carcinomatous uterus along with the invaded surrounding structures. It is difficult in any except very early cases to tell whether the growth is too widely extended to preclude hope of cure by radical operation or not. There are, however, certain signs and symptoms which give us valuable information. The most important of these are obtained through vaginal and rectal examination and inspection. When on vaginal and rectal examination one finds that the induration from the cervix extends to the parametrium, that the vaginal wall, especially the anterior portion, is considerably involved, the case is considered beyond the hope of cure. The extension of the growth to the parametrium is indicated by the palpation of a continuous induration from the cervix to the pelvic wall perceptible to the examining finger and interfering with the mobility of the uterus. The examination should be made under anæsthesia. This is indicated in almost every case, the examination being made at the time when the patient is prepared for the radical operation or for the palliative treatment. It should be borne in mind that an inflammatory condition in the parametrium, an infiltration in the same structure due to thrombosed vessels, or an inflammation of the uterine appendages, can simulate extension of the growth. In either of the first two mentioned conditions the differentiation from carcinomatous extension is difficult, while in the latter the condition can usually be told by a careful bimanual examination. In noting the extension to the vaginal walls the examiner should note the amount of their involvement, the probable form of carcinoma, and the depth of induration.

Certain cases of squamous-cell cancer of the cervix spread superficially along the vaginal wall, and if it can be rendered fairly certain that the deeper structures are not involved, even though the vaginal wall be invaded, the radical operation is not contraindicated.

Involvement of the bladder or rectum is a contraindication to hysterectomy. This can generally be ascertained by palpation and by direct inspection of these organs by the cystoscope and proctoscope. It is usually indicated by symptoms referable to them, such as frequent micturition, hæmaturia, vesical tenesmus, painful defecation, blood-stained stools, etc.

Pain is a valuable symptom for indicating the amount of the extension of the growth. When there is severe pain through the pelvis, the back, the loins, lower abdomen, and thighs it usually signifies that the cancer is beyond hope of cure.

Of course, extreme anæmia, infection, and general weakness will, at times, render the radical operation inadvisable until these conditions can be remedied.

Operations for the Cure of Carcinoma of the Uterus.—The three principal operations which are performed for the *cure* of carcinoma of the uterus are: the vaginal, the abdominal, and the combined vaginal and abdominal hysterectomy. The choice of operation depends to a large extent upon the individual operator, but to those who perform each with *equal* dexterity there are certain indications which should influence the surgeon in his choice between the vaginal and the abdominal hysterectomy. The *vaginal* method in early cases is easier to perform; has, as a rule, a lower immediate mortality; and is generally preferable in fat women with wide vaginæ. The *abdominal* operation offers, as a rule, a better hope for complete removal of the growth with its extensions, especially in the parametrium and iliac glands; in it there is less chance of implantation of the cancer cells, and less danger of wounding the ureters and bladder; and it is, as a rule, preferable in women with narrow vaginæ, or where the uterus is much enlarged. The *combined* method offers few if any advantages over the abdominal and has disadvantages which make its use not as usual as either of the other operations.

Vaginal Hysterectomy.—The patient is prepared for both a vaginal and an abdominal operation. She is placed in the lithotomy position and the cervix exposed by means of four vaginal retractors, an anterior, a posterior, and two lateral retractors. The cervix is caught, if possible, in sound tissue with a strong tenaculum forceps and pulled down. The carcinomatous mass is curetted or cut away thoroughly and the cancerous area thoroughly charred with a cautery so as to check the oozing, to sterilize in a measure the tissue, and to prevent the implantation of cancer cells. If necessary the oozing is checked by sutures. The vagina is now thoroughly cleansed by an assistant, while those engaged in the preliminary curettement clean up for the hysterectomy. All instruments used are sterilized. The cervix is again exposed and caught with tenaculum forceps and drawn forcibly down. Traction sutures can be used. An incision is made, preferably with the cautery knife, well

outside the cancerous infiltration through the vaginal mucosa and encircling the cervix. By dragging strongly upon the cervix and by use of the cautery knife or blunt dissection the vagina can be separated from the cervix, care being taken to keep well outside the cancerous infiltration. The bladder is next separated from the cervix. This is not difficult in case the bladder is not invaded by the new-growth. It is best done by blunt dissection and snipping the resistant tissue with scissors. When the peritoneum is reached it is incised and the opening, which is about 3 to 4 cm. wide, is made larger by dilatation with the fingers. The septum between the cul-de-sac of Douglas and the vagina is cut through, leaving a narrow cuff of the septum on the cervix, the vessels which bleed being clamped or tied. The intestines are protected and kept out of the field of operation by means of sponges or gauze pads with strings attached. An ecarteur of Landau is inserted into the peritoneal cavity anterior to the uterus and the fundus is dragged down into the vagina by successively catching it with tenaculum forceps. The tube and ovary on one side are exposed and a large clamp is thrust through the broad ligament near the uterus, securing the vessels of these structures and likewise those of the round ligament. Another clamp is placed nearer the uterine cornu and the tissues between the two cut. It is more convenient to replace the clamps by ligatures. This is best done by a whipping-suture ligature of strong catgut or kangaroo tendon. The fundus is now replaced and the uterus is dragged further down into the vagina. A wide separation of tissues, anteriorly and posteriorly, leaves the uterus attached only by the parametrium on each side. A strong clamp is now placed on the lower portion of the parametrium on each side and the tissue cut between the uterus and the clamps. The tissues can be secured by ligatures of strong catgut or kangaroo tendon. The same procedure is carried out on the other side. The uterus is pulled farther down, the remaining parametrium on each side clamped and the uterus is cut away and removed. The clamps are replaced by suture ligatures, and all oozing is checked. The protecting gauzes or sponges are now removed, the peritoneal cavity sponged dry, and after inspecting the field of operation to see that all hemorrhage is checked the peritoneal surfaces of the bladder and cul-de-sac are sutured together. A small piece of gauze is placed in the raw area, the vaginal walls above partially closed and the vagina is lightly packed with gauze.

If it is regarded necessary to remove the tubes and ovaries the clamps are placed to the outside of these structures first or they can be removed after the uterus is out of the way. In carcinoma of the cervix it is usually not regarded as necessary to remove these structures.

In favorable cases the vaginal hysterectomy is not difficult to perform and has a comparatively low mortality. In cases where it is doubtful, if the entire local portion of the cancer can be removed, where there is a wide extension on the vaginal wall, the operator in his attempt to get outside the growth may wound the ureters, bladder, or have hemorrhage which is difficult to control. To those who are skilful in the use of

the ureteral catheters the preliminary catheterization of the ureters is a most valuable aid. The only real objection to their use is the time consumed in placing them in the ureters. This is, however, usually more than counterbalanced by assistance given the operator in avoiding the ureters and in enabling him to give a wider berth to the new-growth.

In many cases it is advisable to split the uterus anteroposteriorly in its median plane. It enables the operator to pull down the halves better, and by enabling him to enucleate the half which is less involved first, renders the operation easier and the enucleation of all of the growth more certain than it could otherwise be. Kelly goes a step farther, and after bisecting the uterus amputates the upper half of one or both sides, and in this way secures a better field of operation. An objection which has been raised to both these procedures is that there is a greater liability of implantation of the cancer cells. This is, in my judgment, of minor importance to complete enucleation and lowering the immediate mortality of the operation. The greater part of the cancerous tissue can be destroyed by cauterization before operation and in this way liability of the implantation lessened.

In women with narrow vaginæ the difficulty of exposure is lessened materially by incising the perineum and vagina deeply into the ischiorectal fossa. This has been more in use in Europe than in America. Schuchardt, who has carried this method to its greatest extent, makes two incisions. On the side most involved he divides the entire vaginal wall from beneath to the vault of the vagina, cutting through all the soft structure into the ischiorectal fossa. He makes another incision in the skin from the lower end of this incision in a curved manner around the anus and deepens it until it reaches the sacrum. In this way he gains much room and can reach the parametrium and ureters much better than by the usual method. It is of much greater magnitude than the usual vaginal operation, and most operators prefer the abdominal route in such cases as would require Schuchardt's "paravaginal incision."

The clamp method which was in vogue a few years ago has lost much of its popularity. The method consisted in the use of strong clamps to secure the bloodvessels. These were left *in situ* for two to four days, the vagina being packed with gauze. The method was easy and rapid of execution, and gave a mortality which compared favorably with others, but caused the patient great discomfort, and as the peritoneal cavity was not closed off, intestinal obstruction from adhesions rather frequently resulted. A combination of the clamp and ligature is useful in difficult cases. Ligatures are applied to the broad ligaments, the peritoneum closed and clamps left on the parametrial tissue. In cases where rapid work is necessary this saves much time.

THE ABDOMINAL HYSTERECTOMY.—The abdominal hysterectomy is especially suitable in cases where the abdominal walls are not very fat, where the vagina is narrow, where there is an extension in the parametrium, where it is probable that the iliac glands are involved in

carcinoma of the body of the uterus, or where the uterus is much enlarged as the result of myomata or pregnancy.

The original Freund operation has of recent years been much modified.

The following description is practically that given by Krönig,[1] and is one of the most complete of the various methods advocated for performing abdominal hysterectomy, which was an improvement of the methods advocated by Reis and Clark. It is a modification of Wertheim's.[2] After destroying and sterilizing the growth as much as possible by curetting, cauterization, and cleansing, a median abdominal incision is made, extending from the umbilicus to near the pubes. The uterus is caught with strong tenaculum forceps and drawn forcibly upward and to one side. Ligatures are placed, one on the ovarian vessels near the pelvic wall, a second on the round ligament near the internal inguinal ring, and a third near the uterine cornu. The third secures the anastomosing vessels from the uterine artery and keeps the field of operation free from blood. The broad ligament is incised on the median side of the ligatures on the ovarian vessels and the round ligament, separated into two flaps from this incision by blunt dissection, and the incision continued around across the front of the uterus through the vesicouterine fold of peritoneum.

The uterus is separated from the bladder by blunt dissection well down on the vaginal wall, the peritoneal fold being drawn forward. One can now follow the ureter from the posterior leaf of the broad ligament to its entrance into the parametrium. By making a lateral incision posterior to the ovarian vessels through the peritoneum it is easier to find and follow the ureter. By separating the posterior flap or leaf of peritoneum from the structures beneath, the ureter can be lifted up with it and thence followed to its entrance into the parametrium. After exposing the ureter the uterine artery is ligated outside its crossing with the ureter. The same procedure is carried out on the other side. The uterus is now drawn forcibly upward and forward, the peritoneum over the posterior vaginal vault incised, and the vagina separated from the rectum, the sacrouterine ligaments being clamped and cut. The vagina is now separated by blunt dissection from the surrounding tissue on all sides to a point well below the carcinoma. The separated vagina is next clamped by means of two large right-angled clamps, cut off, and the uterus removed. Bleeding points are controlled by ligatures, sutures, etc. The next step consists in laying bare the iliac vessels and the removal of the glands along with the surrounding fat by blunt dissection. The regular order of dissection is as follows: the outer side of the common and external iliac vessels, then the inner side, and finally the angle between them. The base of the flap of the vesicouterine fold of peritoneum is sutured to the upper margin of the anterior vaginal wall. This covers in the raw area on the bladder and tends to prevent cystitis. The peritoneal flaps are brought together, covering in the broad ligament, small drainage tubes being

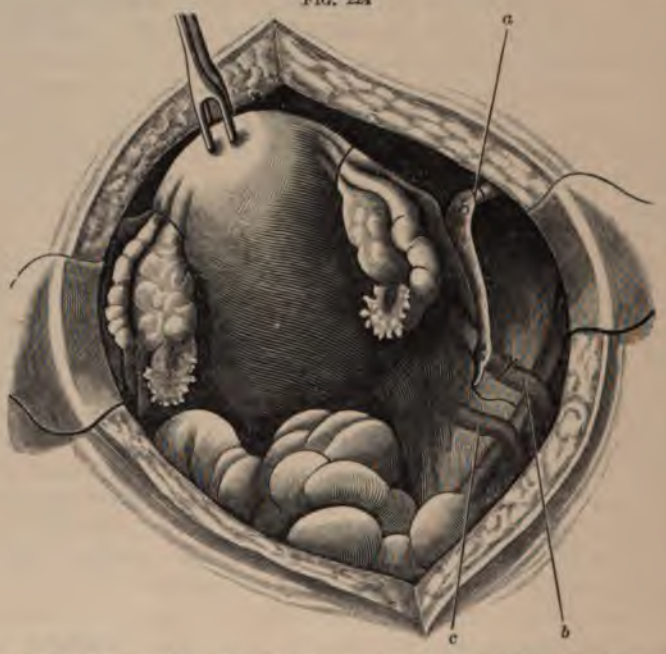
[1] Monatschr. f. Geb. u. Gyn., Bd. xv. Heft 6.

[2] Archiv. f. Gyn., Bd. lxv. Heft 1.

placed in the broad ligaments, and are brought out into the vagina. The peritoneal flap posteriorly and the posterior vaginal wall are sutured together, and finally the vesicouterine flap of peritoneum is sutured behind, so as to cover in the vaginal vault from the peritoneal cavity.

Pryor, Bovée and others advocate the ligation of the internal iliac vessels before beginning the dissection of the pelvis in order to check hemorrhage from its branches. Sampson advocates the placing of suture ligatures encircling the vagina below the carcinoma before beginning the abdominal operation. They are placed deep, especially on the lateral walls, and he thinks they save a considerable loss of blood.

FIG. 224

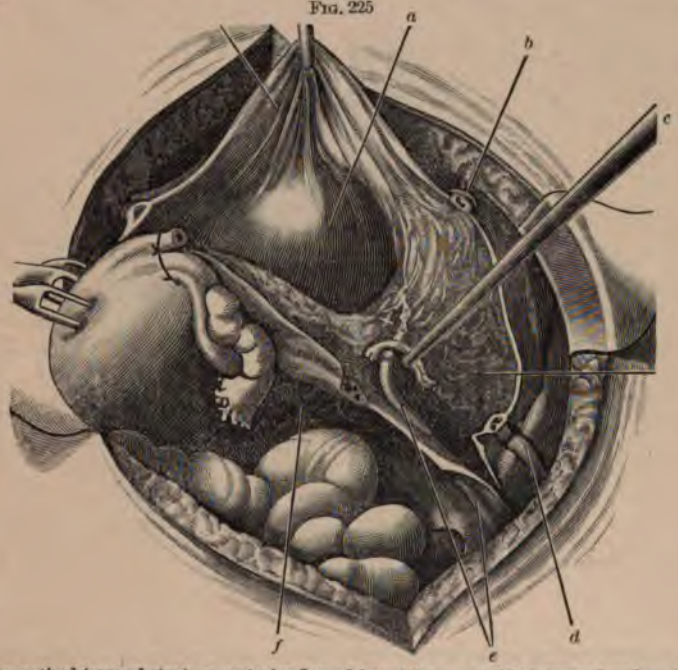


Kronig's method (first step): *a*, ligated ovarian vessels; *b*, ligated round ligament; *c*, uterine artery; ligatures near uterine cornua are shown.

The technique of the Wertheim-Krönig operation is in many cases difficult to carry out, but it represents the most complete operation now done for carcinoma of the uterus. Wertheim, in a series of 60 cases, found the glands carcinomatous in 31.7 per cent., and in cases which were not far advanced in 15 per cent. The operation here described removes the local involvement better than any other, and more of the glandular structure at the same time. The immediate mortality of so extensive an operation in the hands of the average gynecologist is necessarily great, but the percentage of permanent cures is also greater than in the vaginal or abdominal hysterectomy as usually performed. In his 30 cases Wertheim lost 5, which is a mortality of 16 per cent. In our choice of an operation we should decide in favor of the one

which gives the greater percentage of permanent cures, for unless we hope to effect a complete cure, hysterectomy for cancer is not justifiable. By Krönig's modification of Wertheim's method the iliac glands are removed, the parametrium can be widely excised, there is little danger of ligating the ureters, and comparatively little danger of hemorrhage and of peritonitis. The ureter is left attached to the peritoneal flap as far as possible. It was found that in cases where the ureter was dissected bare, it was owing to poor blood supply liable to slough and form a ureterovaginal fistula. Sampson[1] lays stress upon the preservation of the periureteral arterial plexus in exposing and separating the ureters.

FIG. 225



Kronig's method (second step): *a*, anterior flap of broad ligament lifted toward pubes; *b*, severed round ligament; *c*, forceps grasping uterine ligament to outer side of ureter; *d*, severed ovarian vessels; *e*, posterior flap of broad ligament retracted exposing the ureter; *f*, uterosacral ligament.

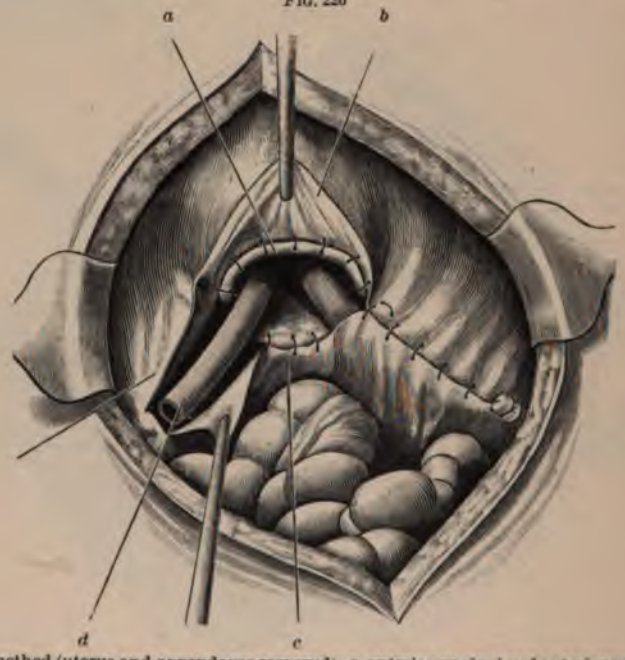
Amann, Mackenrodt, Krönig and other operators, in widely extended cases of carcinoma of the cervix, advocate the transverse abdominal incision, with the formation of a flap of peritoneum and fascia to shut off the general peritoneal cavity from the pelvis during the operation. The method is practically as follows:

The incision is begun about three fingers' breadth to the inner side of the anterior superior spine of the ilium and is carried in a gentle curve one finger's breadth above the symphysis to a point on the right side corresponding to the point of beginning. The skin, fat, and superficial fascia of the abdominal wall are divided, the recti muscles severed from their attachment to the bone, and the epigastric vessels ligated

[1] Johns Hopkins Hospital Bulletin, February, 1904.

side corresponding to the point of beginning. The skin, fat, and superficial fascia of the abdominal wall are divided, the recti muscles severed from their attachment to the bone, and the epigastric vessels ligated and cut. The deep layers of fascia and peritoneum are now separated by blunt dissection from the overlying muscles for a sufficient distance to form the flap. Next the deep fascia and peritoneum are cut through along the line of the original incision. The bladder which sinks deeply in the pelvis after opening the abdomen is held forward by a few sutures through its peritoneum to the symphysis. After ligating and severing the ovarian vessel and round ligaments, the flap formed from the

FIG. 226



Kronig's method (uterus and appendages removed): *a*, anterior vaginal and anterior peritoneal flap sutured together; *b*, anterior peritoneal flap and bladder; *c*, posterior peritoneal flap sutured to posterior vaginal wall; *d*, drainage tube inserted.

anterior abdominal wall by the peritoneum and fascia is stitched across the posterior wall of the pelvis from the stump of the ovarian vessels on one side to the corresponding point on the other, thus shutting off completely the general peritoneal cavity from the pelvis during the operation. The procedure seems to be especially useful in preventing shock, but has caused an increased immediate mortality due to suppuration in the abdominal wall.

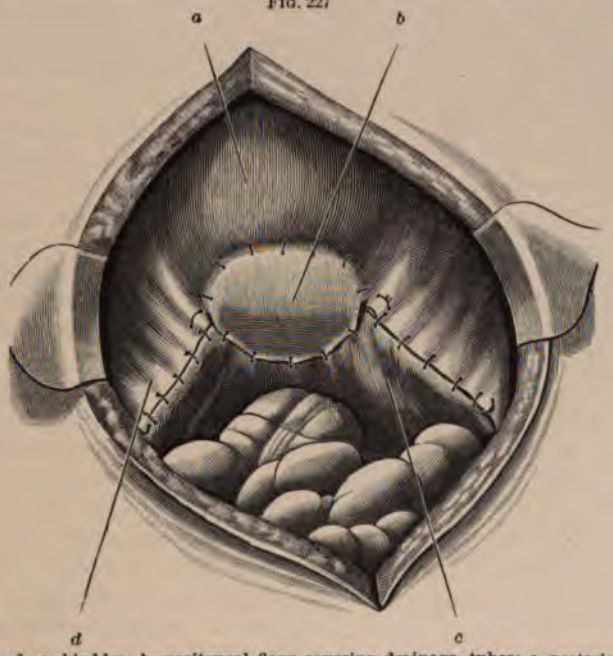
Many operators only remove the iliac glands when they are palpable, but until the peritoneum over them is dissected away one cannot always feel a gland that is distinctly enlarged. So Wertheim and Krönig advocate the systematic removal of the glands in all cases. Wertheim[1]

[1] Wiener klin. Wochenschrift, 1904, No. 28.

has recently stated that practically all of the cases in whom the glands were found to be carcinomatous had shown recurrences, and, therefore, he doubts if the removal of the iliac glands will prevent recurrences. However, until better statistics are forthcoming we will continue to remove them.

The catheterization of the ureters is a valuable aid in abdominal hysterectomy, especially when one has not had a sufficient number of cases to easily find and follow these structures. In very fat women the ureters are, at times, difficult to palpate. Where the ureter is found involved in the carcinomatous tissue it is useless to attempt the entire

FIG. 227



Kronig's method; *a*, bladder; *b*, peritoneal flaps covering drainage tubes; *c*, posterior peritoneal flap on the right side; *d*, anterior peritoneal flap on left side.

removal of the growth unless one follows the plan advocated by some operators of boldly cutting off the ureter above the growth and subsequent to the enucleation of the carcinoma, grafting the end into the bladder. This would be perfectly proper if there was any guaranty in cases so widely extended that all the cancer would be removed. Only a wider experience and larger statistics can show this.

Where from any cause it is impossible to carry out Wertheim's technique, and many such cases will arise in the hands of the average gynecologist, and in early cases of carcinoma of the uterine body a more rapid and simpler operation can be done, as follows: Ligation of the ovarian vessels and round ligaments, separation of the bladder, and ligation of the uterine arteries as usual in panhysterectomies. Next cutting through the septum between Douglas' cul-de-sac and the vagina,

making a small opening in the median line. A clamp curved almost at right angles is placed so as to leave a cuff of vagina on the cervix, and the tissues between the clamp and cervix are cut through. Another and another clamp are used in the same way. The uterus is then removed and the clamps replaced by whipping-suture ligatures. The peritoneal flap is brought over to the posterior peritoneum. This operation is rapid and less blood is lost than usual, due to the use of the curved clamps.

WERDER'S OPERATION.—The essential points of this operation consist in ligating the uterine vessels near the pelvic wall, separating the vagina from the surrounding structures to within an inch of the vulva anteriorly and about half-way down the posterior and lateral walls, pushing the uterus into the pelvic outlet, suturing the peritoneal bladder flap to the rectum, and finally with a cautery knife enucleating the separated vagina and uterus from below after closure of the abdominal wound. The reasons for the enucleation of the vagina in this manner are to avoid bacterial infection and implantation of cancer cells, and the removal of any cancerous nodules in the vagina.

BYRNE'S OPERATION.—Byrne's operation consists in a high amputation of the cervix with a cautery knife. He claims most gratifying results.

The operation is thus described by its author:[1] "A diverging volsella, after being passed well into the cervical canal, should be expanded to a proper degree and locked, so as to afford a complete control of the uterus during the entire operation. By alternate traction and upward pressure of the uterus an accurate idea may be obtained as to the proper point to begin the circular incision, so as to avoid injuring the bladder or opening into the cul-de-sac of Douglas. As to the latter, however, should it be found that the disease has involved the retrouterine tissues and that its excision or destruction by the cautery cannot be affected without opening into the peritoneal cavity, there need be no hesitation in doing so. I have never known any harm to come from it whether it were done accidentally or by design. Should it be evident at the outset that the operation, in order to be thorough, must include a portion of the cul-de-sac, it will be better to make the line of incision anterior to this, until the cervix has been removed, and leave the incision of the retrouterine parts by the cautery knife to be the final procedure. Under these circumstances all that will be needed will be an antiseptic tampon properly applied. In proceeding to make the circular incision, the cautery knife, slightly curved and cold, should be applied close up to the vaginal puncture, and from the moment the current is turned on, should be kept in contact with the parts to be incised. Before removing the electrode for any purpose, such as change of position or altering the curve of the knife, the current should first be stopped and the instrument again placed in position while cool before resuming the incision. In other words, if the knife, though heated only to a dull red, be applied to parts at all vascular, hemorrhage, more or less, will

[1] A Text-book of the Diseases of Women. (Cited from Hirst.)

certainly follow; whereas, the cool platinum blade being already in contact with moisture as the current is being transformed into heat, vessels are shrunken or closed even before they are severed. This is a very important point and should never be lost sight of in all cautery operations. The circular incision having been made to the depth, say, of a quarter of an inch, it will now be observed that by increased traction the uterus may be drawn much farther downward, and by directing the knife upward and inward the amputation may be carried to any desired extent. In cases calling for amputation above the os internum it will be better to excise and remove the cervix first; then by dilating the upper canal sufficiently to admit the diverging volsella, once more proceed as in the first instance, taking care, however, to keep within bounds. It will be found that the cupped stump can now be drawn down and made to project as a more or less convex body. In all cases the dome-shaped electrode should be passed over the entire cavity repeatedly so as to render the cauterization still more complete. It is important to add, that, in carrying the knife toward the sides of the cervix, circular and other arterial branches are likely to be encountered, and, hence, in this locality particularly, a high degree of heat is to be carefully avoided. As an additional security against hemorrhage the convexity of the knife should be pressed against the external surface of each particular section cut, so as to close the vessels more effectually. It is well to state that the metallic parts of the electrode for about two inches should be covered with a strip of thin flannel, so that the vagina may be protected from injury through the reflected heat."

Pryor modifies Byrne's operation in that he removes most of the tissues of the cervix first with a sharp-pointed knife, curved in the flat. This leaves a hollow cone-like excavation which extends above the internal os. The dome-shaped electrode is inserted to the fundus uteri *cold*, and the entire uterine cavity is charred. The cautery is now applied to the cervical tissues which have been left behind, and the entire cervix converted into a charred mass. This also destroys some of the pericervical tissues. No dressing is applied and antiseptic douches are given occasionally until the parts have healed. The vagina must be protected from the heat by wooden retractors and by the application of gauze wrung out in ice-water. Pryor remarks (*Gynecology*, 1903) that "The true indication is for a removal of the upper third of the vagina and the parametric tissue and glands outside the ureter. This is accomplished only by laparotomy, never by vaginal hysterectomy.

The Prognosis of the Operative Treatment of Carcinoma of the Uterus.—A large percentage of all cases of carcinoma of the uterus upon whom hysterectomy is performed finally die of the disease. It is universally agreed that a large majority of the recurrences which take place after operations for cancer of the cervix occur in the tissues which were contiguous to the cervix—*i. e.*, the vaginal wall, the parametrium, etc.

The next largest number of recurrences occur in the lymphatic glands. In 202 cases Winter found metastases in 9—*i. e.*, 25 per cent. Wertheim, in 60 cases upon whom he removed the glands at operation, found these

structures carcinomatous in 31.7 per cent. where recurrence occurred after hysterectomy for carcinoma. In a small percentage of the cases there are metastases in distant organs, and undoubtedly there is, at times, an implantation of the cancer cells in the raw surfaces, made at operation.

In cancer of the body of the uterus there is less likelihood of a recurrence, probably because the contiguous tissues are not so apt to be involved. Hirst states that recurrences occur after hysterectomy for carcinoma of the body of the uterus in one-fifth to one-third of the cases; and this agrees with Cullen's statistics.

In making an estimate of the results of operation for cancer of the uterus one must consider: (1) the percentage of all cases who are operated upon; (2) the mortality of the operation, and (3) the absolute healing. There are few statistics which give all of this information, and consequently most of them are of little value. One operator may have a small percentage of deaths from operation and a high percentage of permanent cures because he selects his cases and operates only upon early and favorable ones. Another may have a much higher immediate mortality and a smaller percentage of cures because he operates upon less favorable cases. In cancer of the cervix Richelot claims 10 per cent. of cures; Winter, 30 per cent.; Olshausen, 18 per cent.; Schauta, 31 per cent.; Kaltenback, 14 per cent.; Fritsch, 36 per cent.; Leopold, 53 per cent.; Jacobs, no cures in 82 vaginal hysterectomies; Baldy and Robb, less than 5 per cent.; Kelly, 5 per cent.; Noble, 13 per cent.; and Hirst, 7 per cent. The best statistics are found in an article by Olshausen[1] and is given below:

Operator	Zweifel.	Wertheim.	Olshausen.
Method of operating	Vaginal.	Abdominal.	Vaginal.
Number of cases	260	120	671
Per cent. of cases operated upon	25.07%	40.3%	31.06–44%
Primary mortality	5.45	20.0	6.00
Free from recurrences after two years	44.00	77.0	74.00
Free from recurrences after five years	35.06	.....	38.85
Percentage of cures of all cases after five years	9.72	.....	18.00

We see from the above table how small a proportion of absolute cures are accomplished even in the hands of men of such wide experience and such acknowledged skill as the gynecologists given in the table. In the hands of the average operator both the primary mortality and the percentage of recurrences are higher. It is safe to assert that not more than 10 per cent. of all cases of cancer of the uterus are cured by operation. One has only to read the articles of men with large experience to find how much depends upon the operative skill, technique, etc., of the operator. In nearly every case the percentage of cases operated upon increase, the primary mortality diminishes, and the number of permanent cures increase with the perfection of the technique of operation by the individual operator.

The immediate mortality of hysterectomy for carcinoma of the cervix is very high even in skilful hands, the principal causes of death being

[1] Zeitsch. f. Geburt., Bd. 50, Heft 1.

sepsis, hemorrhage, shock, infection of the urinary tract, ligation of a ureter, and pulmonary embolus. In so extensive an operation as the one advocated by Wertheim and Krönig, or the one by Schuchardt, much time is consumed in carrying out the details, there is considerable oozing, and the patient is in an unfavorable condition to combat the invasion of the bacteria which are so frequently present in the new-growth and vagina. Hence, care should be exercised to sterilize the cervix and vagina as thoroughly as possible before, and to protect the peritoneal cavity and pelvic tissues as much as possible during operation. Ligation of or injury to a ureter is not an infrequent complication of hysterectomy for carcinoma of the uterus. This is especially true in cases where the growth has invaded the parametrium. There is apt to be in these cases considerable difficulty in securing the uterine vessels in the vaginal operation and the operator rather frequently clamps or ties the ureter in controlling the hemorrhage. In the abdominal hysterectomy where the ureters are dissected bare they are apt to slough and a ureterovaginal fistula is the result. To prevent this Krönig leaves the ureter attached as much as possible to a peritoneal flap and in this way avoids injury to the small vessels which accompany the ureter. Most cases of renal infection come either from a ureteral fistula or a cystitis. Wertheim advocates bladder irrigations at each catheterization until the patient can completely empty the bladder voluntarily.

The Treatment of Inoperable Carcinoma of the Uterus.—A large percentage of all cases of carcinoma of the cervix who present themselves are regarded as inoperable. This generally results from the fact that the patient comes after the growth has extended so widely that there is no hope of permanent cure. It occasionally happens that the carcinoma is not widely extended, but the condition of the patient is such that she would probably succumb to the shock of the radical operation. Our treatment depends somewhat upon the case—*i. e.*, under which of these two divisions it falls. In the first group of cases the principles of treatment are to prolong the life of the patient and to make her as comfortable as possible without having in view any complete removal of the carcinoma. In the second class of cases our object is to build up the woman and at the same time to check the ravages of the growth with the idea of a complete removal of it at some future time.

The chief things which we have to combat in inoperable cases of carcinoma are *hemorrhage*, the *foul discharge*, and *pain*. In a small number of cases hemorrhage is not a marked symptom. These cases are the hard scirrhous form of cancer of the cervix. Here there is little breaking down of tissue and much of the vaginal wall and pelvis may be filled with cancerous infiltration with little or no ulceration. There is generally a serous discharge with an offensive odor, but even this may be wanting. The principal symptom here is pain. A slightly antiseptic vaginal douche to keep the vagina clean and morphine to relieve pain are indicated in these cases. Any operative procedure like curettement or cauterization is contraindicated.

The inoperable cases of carcinoma which are favorable for operative, palliative treatment are the cauliflower growths, ulcerative carcinoma of the cervix, and a few cases of carcinoma of the body. In these cases one must exclude those where there is much involvement of the anterior and posterior vaginal wall, where, in consequence, the peritoneal cavity or the bladder is liable to be invaded at the operation. In these cases hemorrhage is frequently a pronounced symptom.

The following treatment should be carried out in these cases where the cervix is the part involved. The patient is anæsthetized and after the usual cleansing of the genitals the cervix is exposed and, if possible, pulled well down toward the vulva. With a sharp spoon curette the growth is rapidly removed. The curettement should be thoroughly done and the remaining tags of tissue cut away with scissors. The resulting cavity is now charred over its entire surface with a cautery at a red heat, the vagina being protected from burning by means of specula. The cauterization serves two purposes—*i. e.*, it checks the oozing, and destroys some of the remaining cancer. The cavity is finally packed with iodoform gauze which is removed in four to five days. The after-treatment consists in applying tincture of iodine. thoroughly to the cavity and repacking with gauze every two or three days until the cavity is shrunken and the offensive discharge has ceased. A favorite treatment by many is the repeated application of zinc chloride after the curettage. A 50 per cent. solution of zinc chloride is applied to the carcinomatous cavity by means of a cotton tampon moistened with the solution. The vagina is protected by a gauze tampon smeared with bicarbonate of sodium ointment (1 part bicarbonate of soda, 4 parts vaselin), or a tampon soaked with a saturated solution of bicarbonate of soda. This neutralizes the zinc chloride which may come in contact with the vagina. The cotton tampon can be allowed to remain several days and is then removed by gently pulling upon the string with which it is provided. A slough generally comes away with it. The zinc chloride may be applied several times at intervals of a week or ten days, and the vagina is kept free from decomposing discharge by mild antiseptic douches. It occasionally happens that Douglas' cul-de-sac or the bladder is invaded by the curettage. In the former case the peritoneal cavity is sponged free from blood, and gauze is packed lightly in the opening. In case the bladder is invaded a fistula will result and add to the discomfort of the patient.

The treatment described above generally makes the patient more comfortable, causes a marked improvement in her general condition and may add several months to her length of life. Recurrences after hysterectomy should be treated on the same general principles as those laid down above. If isolated nodules are found in the vagina as the seat of operation they should be removed.

In cases of carcinoma of the body of the uterus beyond the hope of permanent cure, one may either do a hysterectomy or a curettage, the object of both operations being to check the hemorrhage. It is seldom in cancer of the body of the uterus that the radical operation is not

indicated for cases where the hemorrhage has continued for several years are often found to be quite favorable for a cure at the operation.

In the last stage of carcinoma the condition of the patient becomes so pitiable that the more frequently one sees these cases the more inclined he is to risk much in an operation for a radical cure. Hemorrhage may now be of frequent occurrence and the use of the tampon becomes necessary at times to control it. Iodoform gauze applied through a small speculum is well adapted to this purpose. The tampon may remain from forty-eight to seventy-two hours and then be carefully removed, the cavity being repacked should hemorrhage recommence. Where there is a vesicovaginal or ureterovaginal fistula the discomfort of the woman is markedly increased by the constant flow of urine, which causes chafing of the parts over which it flows and adds a urinous odor to the one caused by the carcinoma. Frequent bathing, the use of boracic acid solution, and the smearing over of the parts with vaselin, or some other greasy substance, will usually prevent bed-sores and excessive irritation of the skin. In these cases where a fistula exists there is usually an extremely irritable bladder and the patient has a constant desire to use the bed-pan. Irrigations of the bladder through the urethra, the fluid being allowed to flow out through the fistulous opening, will at times add to the patient's comfort. Soothing solutions should be used, such as 4 per cent. boracic acid. Careful attention to cleanliness, food, the stools and the relief of pain by the use of morphine, codeine, etc., are necessary in all cases.

Recently, a few gynecologists have advocated the ligation of the large vessels supplying the new-growth. Pryor advocates the ligation of the ovarian, the internal iliacs, and the obturate arteries in all cases of uterine cancer so far advanced as to preclude hope of its removal and occurring in young women. This expedient, he thinks, prolongs life and alleviates suffering.

The Roentgen and Finsen Ray and Radium in the Treatment of Carcinoma of the Uterus.—Since the introduction of the Roentgen and Finsen rays as therapeutic agents much has been claimed for them in the treatment of cancer. It is as yet too early to say positively just what position these agents will take in the list of remedies for the treatment of cancer of the uterus. At present there is one obvious fact in regard to their use and that is, that in the cases offering a hope of cure by operative procedure, that these agents should *only be tried* when the patient positively refuses to consider operation, or for some good reason the operation is strongly contraindicated. Many writers state that much relief from pain, hemorrhage and the offensive discharge is afforded by the use of the *x*-ray and that the patient's condition improves remarkably. It is doubtless true that such results can be obtained in similar cases by the palliative operative treatment described in the preceding pages. Radium has recently attracted considerable attention in the treatment of cancer. Its value in these cases remains to be proven. Undoubtedly, much harm will result from the indiscriminate use of these remedies until their true position is established by experience.

Carcinoma and Pregnancy.—The simultaneous occurrence of carcinoma of the *cervix uteri* and pregnancy in the same woman is rare, but it is, nevertheless, a question of great interest and importance. Von Winckel found in 20,000 labors, 10 cases complicated by carcinoma; Stratz in 17,832, 7; Sutugin in 9000, 2; Fehling in 3000, 5; and Sarwey[1] in 5001, 7 cases.

The largest percentage of uncomplicated cases of carcinoma of the cervix, according to the author quoted above, occurs between the ages of forty and fifty years, while the greatest number of women in whom carcinoma and pregnancy exist at the same time is between the ages of thirty and forty years. This explains to a large extent why we see the two so seldom in the same woman, carcinoma being disposed to occur after the woman has passed the childbearing age. This is not the only reason for the rarity of the occurrence of the two conditions in the same woman, another, a very important one, being that conception is much less likely to take place where carcinoma exists. This is especially true where the ravages of the disease are considerable.

The women in whom this complication most frequently occurs are those who have borne many children. In nearly all cases the conception occurs after the beginning of the cancer, so that in a woman with this condition of the cervix, pregnancy would be most likely to occur where there was a widely patulous os, as is the case in most women who have borne several children. Carcinoma also, as we have previously seen, occurs most frequently in multiparæ.

It is conceivable that pregnancy may take place in a uterus whose *body* is the seat of a carcinoma, but it is not probable, and if it did occur the woman would doubtless not go to term. There are no undoubted cases in literature where pregnancy coexisted with carcinoma of the *corpus uteri*.

Symptoms.—The symptoms of carcinoma occurring with pregnancy differ from those of the non-pregnant woman only in that they are nearly all exaggerated. In consequence of the increased blood supply of the parts the growth of the tumor is more rapid, there is more profuse hemorrhage, more leucorrhœal discharge, etc. Of course, the symptoms of pregnancy are superimposed upon those of the cancer.

Diagnosis.—The diagnosis of carcinoma in these cases offers difficulties only in its early stages and in suspected cases a histological examination of an excised portion of the cervix should be made. It is usually more difficult in these cases to diagnose the *pregnancy* in its first three months. The history of pregnancy is obscured by the symptoms of the carcinoma, as, for instance, there may have been almost constant hemorrhage from the cervix throughout the pregnancy. The signs on palpation may likewise be deceptive, for the uterus may be considerably enlarged in carcinoma in consequence of endometritis and metritis. This resemblance to pregnancy is especially pronounced in cases of pyometra, which not infrequently is seen in carcinoma of the cervix, the fundus here being both enlarged and soft. After the third month of pregnancy the diagnosis should not remain in doubt. The most frequent cause

[1] Sarwey-Veit's Handbuch der Gynäk.

of error is a failure to make a careful bimanual examination. There is a decided tendency to *miscarry* in women with uterine carcinoma due to anæmia, loss of strength, the inflammatory processes incident to the new-growth, and the extension of the carcinoma to the uterine mucosa. *Spontaneous rupture* of the uterus during pregnancy occasionally occurs where the growth involves the upper portion of the cervix. *Placenta prævia* is said to be more likely to occur also in cases of uterine cancer, and the cause is probably the endometritic processes incident to the cancer. In labor the difficulties to which the carcinoma gives rise depend largely upon the extent and situation of the growth. Where it occupies only one of the cervical lips and is not extensive the labor may take place without serious disturbance; but if the cervix is much involved, and especially if it is infiltrated or eroded high up, it may form an inseparable obstacle to natural delivery. The interesting phenomenon known as *missed labor* occasionally occurs in women with carcinoma of the cervix, the uterine contractions in these cases being insufficient to end the labor. The pathological changes in the musculature of the uterus are given as the cause of this insufficiency.

Prognosis.—The prognosis for the mother depends largely upon how early the new-growth is discovered. In general, the prognosis in pregnant is considerably worse than in non-pregnant women. This is due to the more rapid growth of the process, the necessity of operative procedures in delivery, and the trauma and danger of sepsis in both natural and operative delivery. Sarwey cites from the older literature 601 reported cases, in which 261 women died shortly after delivery. In later years since the introduction of the radical operation for carcinoma the mortality has markedly decreased. The causes of death are inanition, hemorrhage, rupture of the uterus, embolism, and sepsis. Rupture of the uterus alone caused death in over 8 per cent. of the cases cited above.

The *prognosis* for the *child* is extremely bad in all cases except where delivery is done by Cæsarean section. Many fetuses are not allowed to go to term, and a number of the children are sacrificed in the interests of the mother. In cases at or near term Cæsarean section gives a most favorable prognosis for the child.

Treatment.—The treatment will depend upon the stage of pregnancy and whether the carcinoma is operable or inoperable. The general principle which should guide one is the following: In cases favorable for cure, a radical operation should be done at the earliest possible time irrespective of the viability of the fetus. In inoperable cases the treatment of the mother should have in view the preservation of the life of the child, and palliative measures alone are indicated.

In choosing the method of procedure, one should take into account in both operable and inoperable cases whether or not the case is first seen in labor, the month of pregnancy, and whether or not the child is alive.

Sarwey classifies the operable cases of carcinoma as follows:

A—In pregnancy.

1. In the first four months . . . . . } Child not viable.
2. From fifth to seventh month . . . . . }
3. From eighth to tenth month . . . . . } Child viable.

B—In labor.

1. *In the first four months of pregnancy* the treatment in cases favorable for operation is total extirpation of the uterus. The best method of operating is not settled, although the majority of operators advocate the vaginal hysterectomy. The increased mobility of the uterus and dilatability of the vagina due to the serous infiltration of the tissues which occurs during pregnancy renders the vaginal operation easier to perform than in the non-pregnant woman. There is also, it is true, an increased vascularity of the parts, but this has not proved a serious obstacle to the success of the operation. The size of the uterus likewise has not been found to interfere to any extent with this method of enucleation, and should it do so the sac can be emptied of the amniotic fluid thus materially decreasing the size of the uterus. Sarwey has tabulated 29 reported cases of vaginal hysterectomy for carcinoma of the pregnant uterus without a death. While cases have doubtless died from the operation, the above statistics show that the immediate mortality of the vaginal hysterectomy is quite small. The *abdominal* hysterectomy performed according to the Wertheim-Krönig method offers a better hope for permanent cure but will be attended by a greater immediate mortality. While the immediate prognosis of operative treatment in these cases is very favorable, the ultimate results are perhaps worse than in the non-pregnant. Statistics are not forthcoming as to the percentage of recurrences in these cases.

2. *From the fifth to the seventh month of pregnancy* the treatment consists in the total extirpation of the uterus and three methods are advocated: (1) the abdominal, (2) the vaginal, and (3) the combined operation. The consensus of opinion is perhaps in favor of the abdominal hysterectomy. Zweifel favors the supravaginal amputation of the uterus, and then the immediate removal of the cervix *per vaginam*. The latest operation is the vaginal, which was originated by Dührssen. It consists in first curetting and cauterizing the cervix, next in separating the bladder from the uterus and opening into the cul-de-sac of Douglas, in splitting up both anterior and posterior lips of the cervix, extraction of the fetus and placenta, and finally in removing the carcinomatous uterus by the vaginal method. A number of cases where this method has been used have been reported with good immediate results.

3. *In the eighth to tenth month of pregnancy* the treatment consists also in the radical removal of the new-growth, but as the fetus has reached the age of viability its life must be taken into account. The usual method of operating in these cases is the extraction of the child by Cæsarean section and then the removal of the carcinomatous uterus by (*a*) the abdominal, (*b*) the combined, or (*c*) the vaginal hysterectomy. Dührssen and others favor the operation previously mentioned of extracting the child by version after making the anterior and posterior incisions through the cervix. They have named it "vaginal Cæsarean section." After the extraction of the child and placenta the uterus is removed by the vaginal hysterectomy. The abdominal hysterectomy after the abdominal Cæsarean section offers a better prognosis for both mother and child.

After the beginning of labor the method of procedure depends upon the extent of the carcinomatous involvement of the cervix, the progress of labor, and the condition of mother and child. When the carcinoma has involved the entire cervix a spontaneous delivery is probably out of the question. In the early stages of cancer of the vaginal portion of the cervix delivery may meet with little or no obstruction. In the intermediate cases it is difficult at times to decide upon a method of treatment. It is a safe rule to deliver by Cæsarean section where competent surgical aid can be obtained. If the child is dead and labor is in progress, and where surgical aid cannot be obtained, the delivery can be hastened and the danger to the mother lessened by crushing the fetal head. One should bear in mind the danger of rupturing the uterus, hemorrhage, sepsis, etc., where the cancerous involvement of the cervix is high or extensive. After delivery the radical operation should be done. The vaginal hysterectomy is said by some not to be contraindicated after the birth of the child. The abdominal hysterectomy immediately following Cæsarean section is the best treatment in most cases. Dührssen's "vaginal Cæsarean section" is advocated by some for this class of cases.

The treatment of *inoperable* cases must take into consideration primarily the life of the child. The mother's life is at any rate hopelessly lost and any form of treatment has for its object to prolong her life and make her more comfortable. It is possible in many cases to secure a living child, and our efforts in the mother's behalf should endanger the child as little as possible. In *pregnancy* we have to combat the pain; hemorrhage, foul vaginal discharge, bladder and bowel complications, and the general symptoms of anæmia, loss of flesh, etc. Practically the same means are employed for this end as in cases where pregnancy does not exist. For pain morphine, codeine, and other narcotics must be used; for hemorrhage, the vaginal tampon; and for the foul discharge, antiseptic douches. Operative procedures, like amputation of the cervix, cauterization, etc., are contraindicated, as they tend to bring on a premature labor. It is important for both mother and child that the strength of the former should be kept up by nourishing food, good hygiene, and similar measures. Should the mother die before labor begins an immediate Cæsarean section may rescue the child. After labor has begun the treatment which is indicated will depend upon the extent to which the carcinoma will interfere with labor. With a living child the Cæsarean section is generally indicated. The prognosis of this operation for the child is very good, while that for the mother is unfavorable, rather more than one-half of the women dying. Fehling advises the Porro operation with extraperitoneal treatment of the amputated cervix, thus lessening the dangers of sepsis. If the child is dead one can either do a Cæsarean section or extract the child after crushing its head.

DECIDUOMA MALIGNUM.

The term *deciduoma malignum*, *sarcoma deciduocellulare*, *chorio-epithelioma*, *syncytioma malignum*, and *carcinoma syncytiale* have been applied to a very malignant tumor which was first described by Sänger in 1888. The various names which have been applied to the growth indicate the variety of opinions of different authors as to the nature of the tumor. Sänger's first case was reported as follows: A woman, aged twenty-three years, aborted in the eighth week, and died seven months later. At autopsy four large, soft, spongy tumors were found in the uterine wall, with metastases, which showed similar characteristics, in the lungs, diaphragm, tenth rib, and right iliac fossa. Microscopic examination showed the tumor to be markedly hemorrhagic and made up largely of cells similar to those found in the decidua. The metastases presented a similar appearance and had resulted from a transportation of the cells through the venous channels. Sänger believed the tumor to be a species of sarcoma and called it a *deciduo sarcoma*. Pfeiffer, in 1890, published a similar case and called the tumor *deciduoma malignum*, by which name it is now commonly known. Numerous cases have been reported since the appearance of Sänger's monograph, Ladinski, in 1902, having collected 132 reported cases. J. Whitridge Williams, who in 1895 published a monograph on the subject, reported the following case of "a colored woman who had a spontaneous full-term labor. A week later she noticed a small painful nodule on the right labium majus which rapidly increased in size, so that two weeks later it had attained the size of a hen's egg and resembled a hæmatoma in appearance. Shortly afterward it underwent necrotic changes which were accompanied by a profuse, foul-smelling discharge. The patient developed a cough and bloody expectoration and finally died six months after delivery. The nature of the tumor was not suspected during life, but at autopsy the lungs were found to be studded with large numbers of metastases of varying size, which resembled placental tissue in appearance. Similar but smaller growths were present in the kidneys, spleen, and ovary, while a small nodule about 1 cm. in diameter was found in the uterus." He describes the histological findings as follows: "Microscopic examination showed that the uterine growth and the metastases were made up in great part of blood spaces, whose walls were formed by large, clear cells with definite vesicular nuclei. At the margin of the primary growth, invading the adjacent musculature, were large masses of vacuolated protoplasm, which was not divided into individual cells. The nuclei were irregular in shape and stained intensely. Closer examination showed that these protoplasmic masses were similar to and identical in structure with the syncytial layer of the chorionic epithelium; the nature of the individual cells was not so clear, although I was inclined to consider them due to transverse and oblique sections through the syncytial masses." Marchand identified the protoplasmic masses with the syncytium and the individual cells

PLATE XXXIV.

Chorioepithelioma Malignum of the Vagina. (Findley.)

A nodule appeared in the wall of the vagina several months after an apparently normal labor. The case was reported by Schmidt, of Vienna. The accompanying illustration was drawn from a section of the nodule loaned from the collection of Dr. Frank D. Pierce. It represents a covering of normal stratified squamous epithelium. Beneath this is a variable thickness of connective tissue overlying a large clot of blood in which are seen two villous stems covered by proliferating syncytium. Syncytial cells are seen to invade the blood clot.

with those of Langhans' layer. As recent investigations have shown that both the syncytium and Langhans' layer are of fetal origin, the tumor must arise entirely from fetal elements, and have no decidual cells in its structure. It is now generally regarded as due to a malignant proliferation of the two layers of chorionic epithelium. According to this theory the tumor arises from the placenta and not from the uterine structure at all. Cases have been reported, especially one by Schmorl, where metastases are found without the discovery of a primary growth in the uterus. One must conclude from this evidence that the primary growth which gave rise to the metastases is in these cases limited to the placenta.

The *metastases* which have the same structure as the original growth are very frequent. Dorland reports 52 cases in which metastases were found in 70.76 per cent. of them and with relative frequency in the various organs, as follows: In the lungs, 78.37 per cent.; vagina, 54 per cent.; spleen, 13.5 per cent.; ovary, 13.5 per cent.; kidney, 13.5 per cent.; liver, 13.5 per cent.; broad ligament, 10.8 per cent.; pelvis, 10.8 per cent.; brain, 5.4 per cent.

The metastases occur early in the course of the disease. From a clinical standpoint the vulval and vaginal metastases are of peculiar significance, as they may be the first clue to the nature of the malady. In some instances they have been found without any evidence of a uterine growth.

Clinical History.—Deciduoma malignum always follows a pregnancy, whether it be full-term labor, an abortion, an ectopic gestation, or a hydatiform mole. The hydatiform mole seems to bear a special relation to the new-growth, having preceded it in nearly 50 per cent. of the reported cases. Several cases of deciduoma malignum have originated from an extrauterine pregnancy. The first symptoms noted usually are repeated hemorrhages from the uterus, exceptionally in the latter part of the puerperium, generally at the end of a few months, and in a few cases, after a period of two to four years. There is a marked tendency for the pieces of the tumor retained in the uterus to undergo decomposition and this gives rise to an offensive uterine discharge. After curettage, which is generally done to relieve the hemorrhage, the bleeding comes on again after a short interval. Metastases take place early, as a rule, and the malady, usually in a short period of time, causes death. Vaginal and vulval metastases, when recognized as such, are the first evidences of the disease in more than one-half of the cases and show an even greater tendency to hemorrhagic degeneration than the uterine tumor. Williams describes the vulval metastases in his case as "a small painful nodule which rapidly increased in size so that two weeks later it had attained the size of a hen's egg and resembled an hæmatoma in appearance. Shortly afterward it underwent necrotic changes which were accompanied by a profuse, foul-smelling discharge." This metastasis was noticed one week after a full-term labor. Where metastases are present in the lungs there is usually after a time cough and bloody expectoration.

Diagnosis.—The diagnosis of deciduoma malignum depends both upon clinical signs and microscopic examination of curetted or excised tissue. The history of a full-term delivery, abortion or *hydatiform mole*, where the uterus has been completely emptied and the recurrence after a few weeks or months of uterine hemorrhage with a foul-smelling discharge, should arouse one's suspicions. If the typical vulval or vaginal metastases are present, one can be reasonably certain of the diagnosis. Digital examination of the uterine cavity is of value in palpating the soft uterine tumor or tumors, which spring from the wall of the uterus, and readily break down and bleed. Cough with bloody expectoration, and anæmia, add weight to the other evidences of the disease. The microscopic examination of curetted pieces of the uterine tumor or excised portion of the vaginal metastases should make the diagnosis certain. Where there are no vulval or vaginal metastases, where the history is obscure, or a histologic examination of curetted material by a competent pathologist cannot be obtained, one is very apt to mistake the condition for retained secundines and to postpone operation so long that a radical removal of the growth is out of question. The two points of most significance in the clinical history are the previous occurrence of *hydatiform mole* and the presence of *vaginal* or *vulval metastases*.

Prognosis.—The malignancy of the disease is strikingly illustrated by Dorland's statistics, 78.97 per cent. of the cases terminating fatally within six months after the appearance of the symptoms. Where there are no evidences of metastases hysterectomy with the removal of the tubes and ovaries offers a fair hope for cure. A few cases have been apparently cured after the occurrence of metastases in the vulva and vagina. Even the presence of lung symptoms (bloody expectoration and cough) does not make the prognosis absolutely bad, Chrobak and V. Franqué having reported cases of cure after their occurrence. An early diagnosis is just as essential in *deciduoma malignum* as in carcinoma of the cervix, the prognosis depending to a great degree at what stage of its development the disease is discovered. This necessity emphasizes the advisability of the routine histological examination of curetted material.

Treatment.—When it is probable that the neoplasm is confined to the uterus a vaginal hysterectomy with the removal of the tubes and ovaries should be done. After the occurrence of metastases in the vulva or vagina these should be removed at the same time with the uterus and its appendages. With vulval or vaginal metastases and no evidences of uterine involvement the indications for hysterectomy are by no means so clear, the uterus being, at times, not involved. After involvement of the lungs operative procedures are usually useless

SARCOMA OF THE UTERUS.

Sarcoma of the uterus is divided into *sarcoma of the endometrium* and *sarcoma of the uterine wall*. The former arises from the uterine mucosa,

PLATE XXXV.

FIG. 1.

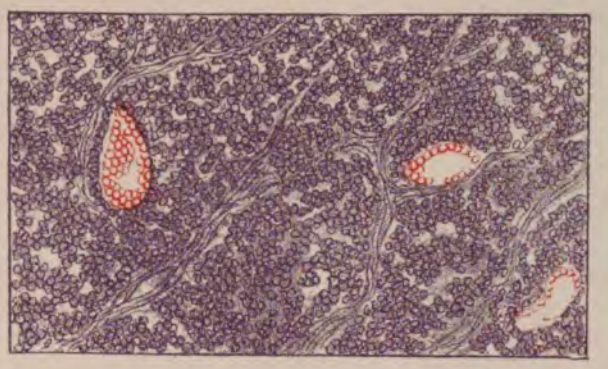


FIG. 2.

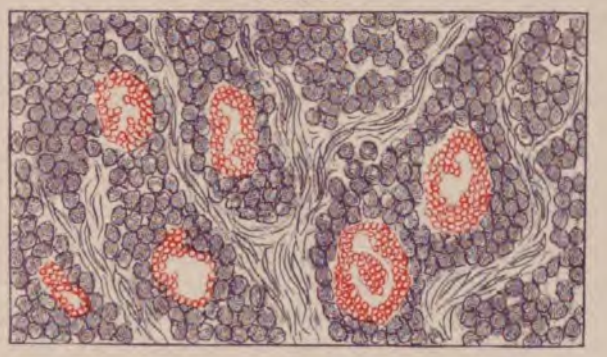


FIG. 3.

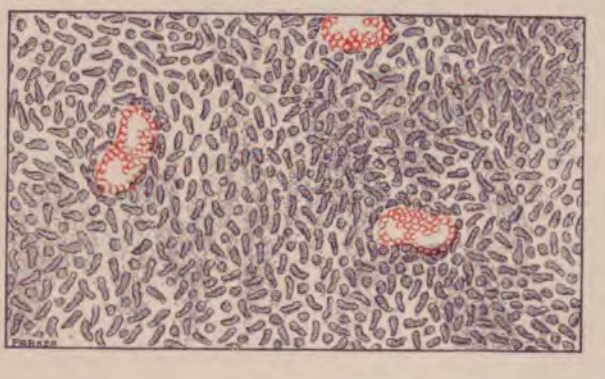


FIG. 1.—Small round-cell sarcoma. Observe that the vessels are mere blood-spaces for the most part destitute of walls, that the cells are composed almost entirely of nuclei, and that they are of the same size as the red blood-corpuscles. Muscular elements are invaded and mostly destroyed by sarcoma. 250 diameters.

FIG. 2.—Large round-cell sarcoma. The nuclei occupy almost the entire cells. The blood-spaces have no walls. The cells are five or six times as large as the red blood-corpuscles. The sarcoma has invaded and nearly destroyed the muscular tissue, the remainder of which is shown in the form of waving fibrous-like tissue running irregularly across the field. 250 diameters.

FIG. 3.—Small spindle-cell sarcoma. Cells mostly composed of nuclei about twice as large as the blood-corpuscles. Blood-spaces have no walls. 250 diameters. (Dudley.)

while the latter may arise from a myoma or fibroma, or from the uterine wall itself. The origin of the tumor in each case is from the connective-tissue cells or possibly, at times, from the muscle cells. Clinically, it is convenient to divide sarcoma of the uterus into *sarcoma of the body* and *sarcoma of the cervix.*

Frequency.—While the uterus is not the seat of sarcoma nearly so often as it is that of carcinoma, yet the occurrence of the former is not of such frequency as was formerly thought. Geisler, in 2369 gynecological cases at the Breslau Clinic, found 8 cases of sarcoma and 405 cases of carcinoma of the uterus, the proportion of the two thus being 1 to 50. Poschmann found the proportion 1 to 24, Gessner 1 to 38, and Krukenberg 1 to 47.6.

In striking contrast to carcinoma where the larger number of cases are of the cervix, we find sarcoma occurring much more frequently in the body of the uterus. Gessner reckons that sarcoma of the body of the uterus occurs eight times as often as sarcoma of the cervix.

The proportion between sarcoma of the endometrium and sarcoma of the uterine wall is more nearly equal, but the disease occurs rather more frequently in the latter position.

Etiology.—Practically nothing is known concerning the causes of uterine sarcoma. Many theories have been put forth with regard to the etiology, but little or no proof has been forthcoming to substantiate them. The predisposing causes are not so clearly defined as in carcinoma. Childbirth seems to have little influence upon its occurrence. The presence of a fibromyoma seems to predispose to sarcoma in two ways—*i. e.*, by the degeneration of the fibromyoma, and by the irritation which the presence of the tumor causes to the mucosa. Some have suggested that inflammatory changes in uterine fibroids predispose them to sarcomatous degeneration. *Sarcoma of the mucosa* appears fairly often in childhood; there is a decided increase at or about puberty; the largest number of cases are seen between forty-five and fifty-five years, and after that there is a rapid decrease in their frequency. *Sarcoma of the uterine wall* has apparently never been seen during childhood. One case has been reported at the twentieth year. The largest number of cases are seen between the forty-fifth and fiftieth years.

Sarcoma of the Uterine Mucosa.—Sarcoma of the uterine mucosa may appear either as a diffuse or a polypoid growth, the polypoid form occurring about twice as often as the diffuse. In most cases the sarcoma which arise from the cervical mucosa differ in no essential particular from that arising from the mucosa of the corpus uteri. There is one form of cervical sarcoma, however, which has attracted special attention —*i. e.*, the "grape-like sarcoma of the cervix," and a section of this chapter will be devoted to the subject. The largest number of both polypoid and diffuse sarcoma of the endometrium take their origin from the body of the uterus, preferably near the fundus, but they may be found arising at any point in the uterine cavity.

The *diffuse form* of sarcoma in its early stages appears as a more or less uniform thickening of the mucosa over a certain area. Later, the

surface of the growth tends to assume an uneven papillary appearance and, after breaking down, the surface shows loss of substance, is blood-stained, and covered with broken-down sarcomatous masses and blood clot. The *polypoid* form of sarcoma of the mucosa shows microscopically one or more polyp-like tumors which, as a rule, take their

FIG. 228

A round-cell sarcoma of the body of the uterus. (Natural size.) The uterus is considerably enlarged and its walls are thickened. The cervix is intact; its mucosa, as well as that lining the lower part of the uterine cavity, is normal in appearance. Occupying the greater part of the cavity is a new-growth. This is sharply defined from the surrounding mucosa, and has springing from its surface delicate finger-like or polypoid outgrowths. We learn from the text that the posterior wall has been invaded to a considerable depth. It would be impossible, macroscopically, to differentiate between this growth and an adenocarcinoma of the body. (Cullen.)

origin from the deeper layers of the mucous membrane (Fig. 228). At first their contour is more or less globular and their surface smooth, but as they are subjected to pressure from the uterine contractions their surface is thrown into ridges and folds. A few cases have been described which have a similar appearance to the "grape-like sarcoma"

of the cervix. Keitler[1] describes a case where the grape-like structure of the tumor was entirely like the form mentioned below (Fig. 229). On cross-section the appearance of the cut surface varies considerably according to the variety of the sarcoma and the amount of its degeneration. When there is a small amount of connective tissue and little degeneration the cut surface appears more or less homogeneous. It is white or yellowish-white, and at times tinged with red; is soft and marrow-like in consistency, and generally quite friable. Localized hemorrhages and cystic spaces are occasionally seen in the tissue, due to degenerations. Serous infiltration may give it a semitransparent

FIG. 229

Polypoid sarcoma of the uterine mucosa resembling "grape-like" sarcoma of the cervix.

appearance. The polypoid form on account of the greater amount of connective tissue is usually firmer in consistency, whiter in appearance, and on cross-section shows frequently a definite alveolar arrangement due to bands of connective tissue.

There is generally no marked tendency for the new-growth to invade the uterine muscle, although in some cases one finds the wall of the uterus infiltrated with sarcomatous nodules. These are seen at times forming irregular elevations on the peritoneal surface of the uterus and the disease may spread from here to the intestines, omentum, and parietal peritoneum. The uterine wall is usually somewhat thickened over the seat of the sarcoma. The size and shape of the uterus depends upon several things. In the early stages of the sarcoma the uterus is

[1] Monatschr. f. Geb. u. Gynäck., Bd. xviii. Heft 2.

slightly enlarged, softer than normal, and symmetrical in shape. With the increase in the size of the tumor is a corresponding increase in size of the uterus and usually hypertrophy of the uterine walls. As long as the sarcomatous nodules do not infiltrate the uterine muscle the contour of the uterus is more or less that of pregnancy. When such an infiltration occurs the outline of the uterus becomes irregular and nodular. The consistency of the uterus is usually softer than normal, but it varies greatly; when found in a state of contraction it may be quite hard and firm; whereas in other examinations it is soft and boggy. Occasionally the cervical canal is occluded and the uterine cavity becomes dilated by the retained secretion, blood, and decomposed masses of the new-growth. The connective tissue of the pelvis, including the rectum, may all become infiltrated, this infiltration occurring earlier when the neoplasm is situated in the cervix than when in the uterine body. Vesicovaginal and rectovaginal fistulæ seldom or never arise as a result of the sarcoma *per se*.

Histology.—Histologically, sarcoma of the uterine mucosa presents no essential deviations from sarcoma in other portions of the body. The usual classification is as follows: Spindle-cell sarcoma, round-cell sarcoma, and mixed varieties. It may be stated that few if any of the sarcomata are of the pure round-cell or spindle-cell varieties. There is a more or less admixture of the two varieties of cells in them all and the name is given by the kind of cell which predominates. There is likewise a great variation in the size and shape of the cells and of their nuclei. The histological examination of a round-cell sarcoma will show that the tissue is composed of a homogeneous mass of round cells with very little stroma present. The cells are usually fairly uniform in size, and have round, vesicular nuclei. Here and there cell division will be seen. Many delicate blood capillaries are seen running in every direction with little or no connective tissue accompanying them.

In spindle-cell sarcoma there is practically the same picture, only the round cells are replaced largely by spindle cells. When these are cut at a right angle to their axes their appearance is that of round cells.

Giant cells are occasionally seen in both varieties of tumors, but their occurrence is comparatively infrequent.

The mucous membrane is differently affected in the individual cases. At times even with a comparatively large sarcoma one finds the overlying sarcoma intact. The glands of the mucosa are generally fewer in number or absent, although in some cases they are abundant. In the diffuse form of the new-growth there is a tendency for the surface to undergo necrosis early in the disease.

Other forms of sarcoma of the uterine mucosa have been observed—*i. e.*, myxosarcoma, melanosarcoma, lymphosarcoma, angiosarcoma, and chondromyxosarcoma.

Symptoms.—The symptoms of sarcoma of the uterine mucosa bear a marked resemblance to those caused by carcinoma of the body of the uterus, the principal ones being leucorrhœa, hemorrhage, pain, and cachexia. *Hemorrhage* is usually the first symptom caused by the

tumor. It begins usually as an increased menstrual flow and later takes the form of an almost continuous blood-stained discharge, with, at times, a free hemorrhage. With the breaking down of the new-growth the hemorrhage becomes more profuse and the discharge contains at times particles of the necrotic tumor. When the tumor makes its appearance after the menopause the blood-stained serous discharge is usually the first symptom, but after a time more or less profuse hemorrhages take place.

A number of cases of hæmatometra or pyometra have been reported, and the amount of the retained fluid is occasionally enormous, in one case amounting to 15 litres. The cause of the accumulation is that the tumor occludes the cervical canal and the secretions are dammed back in the uterine cavity.

Leucorrhœa, or more properly a watery, blood-stained, vaginal discharge, is the first symptom in about one-fourth of all cases. In the polypoid form of sarcoma especially this discharge may exist for a considerable length of time before actual hemorrhage occurs. The mucous membrane remains intact longer in the polypoid form, and hemorrhage in consequence does not occur so early. The odor of the discharge is at first not offensive, but as necrosis occurs, and especially when the cervix becomes dilated and putrefactive bacteria from the vagina gain entrance, decomposition frequently occurs, and then one finds the extremely disagreeable odor so often seen in carcinoma of the cervix. Pain is usually absent in the beginning of the disease; when the tumor has reached a considerable size or encroaches on the cervical canal the efforts of the uterus to expel the tumor or the uterine secretion may cause cramp-like pain resembling those of labor. With the increase in size of the uterus there is a feeling usually of weight and dragging in the pelvis and with the invasion of the uterine wall or the pelvic connective tissue by the new-growth there is generally dull, constant pain, due to pressure on the nerves in this region. The patients at times complain of frequent desire to urinate, vesical tenesmus, and painful micturition. There is little tendency to the formation of vesicovaginal or rectovaginal fistulæ. Constipation may, in the late stages, be marked and is due both to the limited injection of food and to an infiltration of the pelvic connective tissue causing the act of defecation to be so painful that the patient resists the desire to empty the bowel.

Cachexia and a loss of weight and strength make their appearance at variable periods of time from the beginning of the disease. They are largely due to the loss of blood, to the absorption of the products of decomposition and suppuration, and loss of appetite. Cachexia is, however, thought by many to be a peculiar characteristic of a malignant tumor. In the polypoid sarcoma *inversion* of the uterus is occasionally seen. *Ascites* may appear when the new-growth has invaded the peritoneal cavity. *Diarrhœa* at times is seen when metastases occur in the intestine. *Nephritis* occurs rather frequently and is perhaps a result both of pressure upon the ureters and absorption of the products of decomposition.

The causes of death in 99 cases collected by Gessner were as follows:

Cachexia and metastases	57
Sepsis	28
Nephritis	5
Ileus	4
Incidental disease	3
Uræmia	1
Pulmonary embolus	1

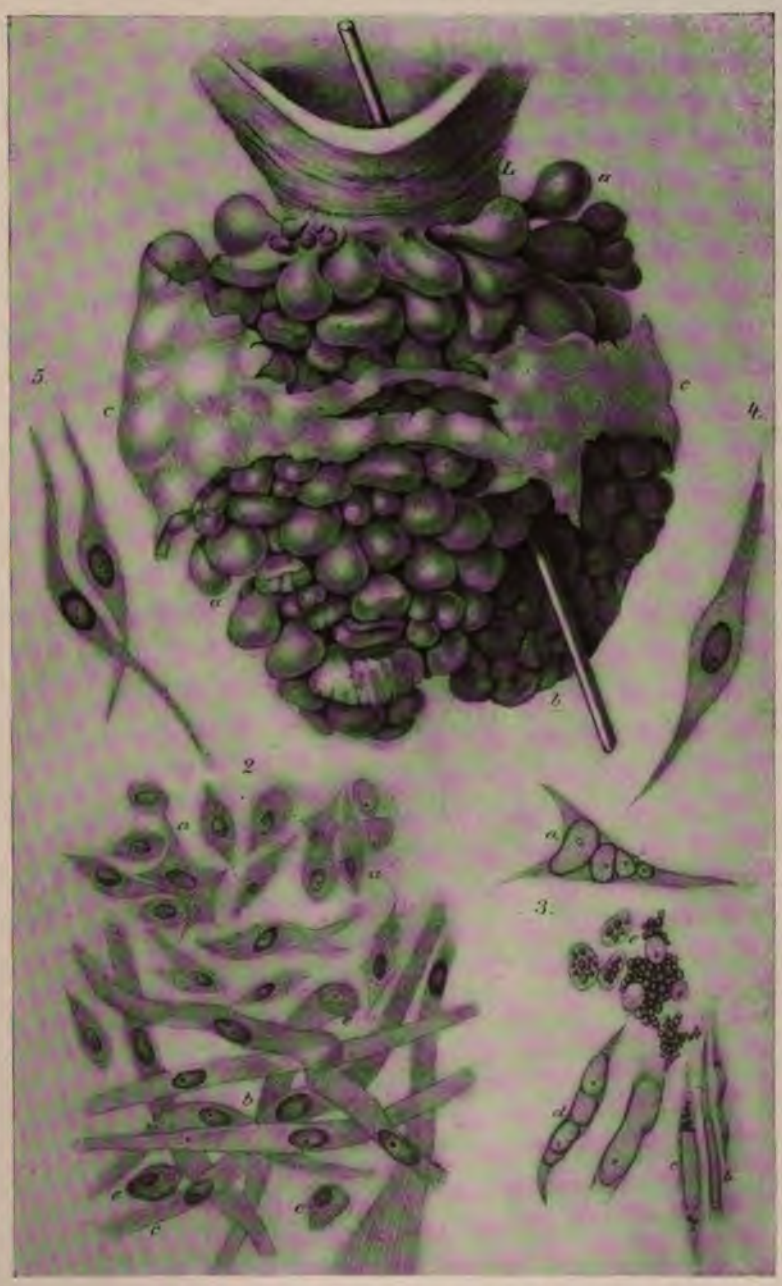
Metastases in sarcoma of the uterine mucosa are comparatively infrequent, occurring according to Gessner in one-fourth of the cases. They occur principally by way of the bloodvessels and take place late in the disease, as a rule. The following is the relative frequency as found by Gessner of their occurrence in the various organs:

Lungs	13 times.
Peritoneum	10 "
Lymph glands	7 "
Intestine	6 "
Ovary	4 "
Omentum	4 "
Kidneys	3 "
Liver	3 "
Fallopian tubes	2 "
Pleura	2 "
Pericardium	2 "
Vagina, brain, vertebræ, skin, suprarenal capsules, bladder, heart, bile-duct, mesentery, parametrium and peripancreatic tissue, each	1 "

The course of the disease is a very variable one. Cases have been reported which have extended over a period of five or more years. Others terminate fatally in a short time, even in a few months. It is perhaps a fair estimate to say that the length of life in these patients is rather longer than in cases of carcinoma of the corpus uteri and considerably longer than in carcinoma of the cervix.

Diagnosis.—While the history of the case and the examination of the patient will in most cases point with probability to the proper diagnosis, the histological examination of curetted, excised, or extruded portions of the tumor is nearly always necessary to arrive at a satisfactory conclusion. The various methods of examination along with the history will, in most cases, point toward a malignant new-growth, but will fail in many cases to differentiate between sarcoma and carcinoma. The *hemorrhage*, especially in women who have passed the menopause, the watery, blood-stained discharge, the cachexia, are all significant symptoms. The information gained by vaginal and rectal *examination* depends both upon the situation of the neoplasm and its size. When it is situated in the body of the uterus the examination may show nothing beyond the fact that the uterus is more or less enlarged and softer than normal. In women who have passed the menopause and who give the history of sarcoma, a large and boggy uterus is extremely suggestive of sarcoma of the endometrium. Pyometra and hæmatometra, especially when of large dimensions, are also important diagnostic signs. These conditions occur in a moderate degree in carcinoma and occa-

PLATE XXXVI.



Hydatiform Sarcoma of the Cervix.

sionally in endometritis, but do not attain the enormous dimensions which they do in sarcoma. When the growth protrudes from the cervix or has dilated the cervical canal sufficiently to allow a digital examination of the uterine cavity, valuable information may be gained by this means. An irregular polypoid tumor which is soft, which breaks down easily and bleeds freely, is indicative of sarcoma. Considerable information may likewise be gained by the uterine sound and more than all by means of the curette. With the sound one can detect the presence of a polypoid tumor or the irregular surface of a diffuse sarcoma, but it is generally impossible to distinguish by this means between a mucous polyp or a small pedunculated myoma and a sarcoma. The diffuse growth may be readily confounded with a polypoid endometritis or retained secundines. With the curette the appearance of the portions of the growth are fairly characteristic. These are usually soft and brain-like. The chief disease with which sarcoma of the endometrium may be confounded are polypoid endometritis, retained secundines, tuberculosis of the endometrium, carcinoma of the corpus uteri, submucous myoma, and syncytioma malignum.

In *polypoid endometritis* the uterus is generally smaller and harder, and there is an absence of the watery blood-stained discharge. The appearance of the curetted material shows a marked difference from sarcomatous material. The former appears as ribbons or pieces of tissue of considerable length and very thin, whereas the sarcomatous masses are soft, friable, and brain-like in appearance.

The microscopic examination is frequently necessary to make a positive diagnosis, especially in the early stages of sarcoma.

In *retained secundines* the history of the case and the information obtained by curettage will usually distinguish the two affections.

Tuberculosis of the endometrium, syncytioma malignum and cancer of the body of the uterus are distinguished positively only by the histological examination.

In *submucous myoma* the palpation of the uterus will usually show this organ to be harder and more irregular in contour than in sarcoma. The curettage in these cases is a valuable procedure. In a myoma, unless it be necrotic, very little tissue is obtained by the curette and the cavity of the uterus is tortuous and distorted, as can be readily detected by means of the sound.

I would emphasize here the value of systematic histological examination of all curettings in cases of uterine hemorrhage. By this means alone we will be enabled to make an early diagnosis in malignant disease of the uterine cavity.

Grape-like Sarcoma of the Cervical Mucosa.—This rare affection, called also *sarcoma botryoides* and *sarcoma colli uteri hydropicum papillare*, was first described by Weber in 1867. Since then at least eighteen cases have been reported.

The growth which springs from the cervical canal, to which it is attached by a more or less broad base, protrudes from the external os into the vagina and has an appearance which closely resembles a hydati-

form mole. While the base or pedicle of the growth presents a firm consistency on account of a preponderance of firm connective tissue, the protruding portion is markedly œdematous, soft, and fluctuating. This portion of the tumor strikingly resembles a bunch of grapes. The individual outgrowths from the surface vary considerably in size, have frequently long delicate pedicles, so that they can be readily detached from the mass. These outgrowths, which, on account of the pressure which they exert upon each other, are not round but flattened where they come in contact, show generally a smooth, moist, glistening surface, are frequently translucent, and are of a yellowish-white, brown, or bluish-black color. They may from degeneration be covered by a layer of dirty discolored secretion. On puncture there escapes from the single outgrowth a transparent, clear, or yellowish fluid, and the outgrowths decrease in size or entirely collapse. The peculiar grape-like form of the new-growth is due, according to Pick, Gessner and others, to the situation of the growth and its rich blood supply. Springing from the cervical mucosa by a broad base it soon dilates the cervix sufficiently to protrude into the vagina. The marked resistance to increase in size in the cervical canal due to the rigid cervix and the slight resistance to growth in the wider vagina causes the tumor to assume a polypoid form. The original papillary form of the tumor is changed to the grape-like appearance because of the œdema produced by interference to return circulation opposed by the pressure in the cervical canal.

This form of sarcoma tends to extend first to the adjoining portions of the vaginal portion of the cervix and thence to the vagina itself. The tissues about its base are later invaded and the parametrium involved. Metastases occur later, as a rule, and generally by way of the bloodvessels, although the lymph glands were in one case involved.

Histology.—Microscopically the tumor shows a fairly constant form. The pedicle shows bundles of firm connective tissue lying between which are nests of round or spindle cells. Numerous bloodvessels, some of which are of large calibre, lie in the bundles of connective tissue. As the portions of the tumor external to the cervix is approached the connective tissue becomes scantier and the cellular tissue more noticeable. Lying between the cells are dilated bloodvessels or lymph spaces, and also dilated cervical glands lined with cylindrical epithelium. The stroma which resembles cellular young connective tissue contains numerous capillaries which are frequently dilated. Giant cells are at times seen. The grape-like outgrowths show externally several layers of epithelium, cylindrical where the outgrowths arise from the cervical canal, and squamous when from the vaginal portion of the cervix or from the vaginal mucosa.

The interior of the outgrowths are made up of swollen œdematous connective tissue or myxomatous-like tissue. Striped muscle fibres and hyaline cartilage are frequently found in the growths, and this has caused several observers to believe that the grape-like sarcoma of the

cervix belongs to the group of mixed tumors and owes its origin to a congenital misplacement of embryonal tissue.

Clinical History.—In the 16 cases collected by Gessner in 1899, 2 were in children between two and three years of age; 6 occurred between the ages of seventeen and twenty-four years; and 5 between forty-five and sixty-three years. Bluhm[1] has since reported a case in a girl of eleven years, Peham[2] 1 in a maiden of nineteen years, and Emmet[3] in a maiden of nineteen and one-half years. We see from these statistics that this form of sarcoma may arise at any age. It is apt to be confounded with the same form of sarcoma of the vagina which is occasionally seen in young children.

Symptoms.—The symptoms which arise are practically those of sarcoma of the endometrium—*i. e.*, hemorrhage, vaginal discharge, pain, pressure symptoms, and loss in general health. These present nothing peculiar to this form of sarcoma. The pressure of the growth upon the urethra and bladder may cause difficulty in voiding the urine and frequent micturition respectively. The first thing complained of may be pain and hemorrhage on sexual intercourse.

Diagnosis.—The diagnosis is made upon vaginal examination. The peculiar grape-like growth springing from the cervix is characteristic. *Hydatiform mole*, which it most resembles, is easily distinguished upon careful examination. Cauliflower carcinoma gives a different picture, and cervical polypi do not present the broad base nor the grape-like outgrowths. In all cases the histological examination will help to decide upon the nature of the tumor.

Prognosis.—The prognosis is bad, all of the reported cases except Bluhm's which was reported two months after operation, having succumbed to the disease. The length of life after discovery of the disease varied considerably, the shortest time being eight months and the longest three and three-quarter years. Most observers do not regard the new-growth as extremely malignant, and believe with the more modern methods of operating that cure can be had when an early diagnosis is made.

Sarcoma of the Uterine Wall.—Sarcoma of the wall of the uterus arises generally by a degeneration of a fibromyoma, although occasionally it has its origin directly from the constituent parts of the uterus itself. It may be extremely difficult to know in an individual case in which way the sarcoma arose. When portions of the unchanged fibromyoma remain, the mode of origin, where the sarcoma has arisen from this form of tumor, is generally apparent. In the case where only sarcomatous tissue is present many difficulties arise. In such cases either the whole of the fibromyoma may have undergone sarcomatous changes or the tumor may have arisen directly from the uterus itself, and it is extremely difficult and at times impossible to distinguish the two. Certain observations are of value in distinguishing the two modes

[1] Archiv f. Gyn., Bd. lxviii , Heft 2, p. 236.
[2] Monatschr. f. Geb. u. Gyn., Bd. xviii., Heft 2, p. 191.
[3] American Journal of Obstetrics, March, 1902.

of origin. Where there has been for years a tumor of the uterus which gives the sign and symptoms of a fibroid and which suddenly begins to grow rapidly and is found on removal to be a sarcoma the presumption is that there has been a sarcomatous degeneration of a fibromyoma. When no such history exists and the sarcomatous tissue shows no sharp line of demarcation from the uterine muscle we can assume that the tumor had its origin directly from the uterine parenchyma.

Sarcoma arising from a degeneration of a fibromyoma is, like the latter, in the large majority of the cases found in the fundus uteri. They are generally submucous, but may be interstitial or subserous. Gessner makes the following division of sarcoma of the uterine wall and states that from reported cases they have been found in the relative frequency: true submucous, 12; submucous interstitial, 10; interstitial subserous, 2; interstitial intraligamentary, 2; true subserous, 1. Where the whole of the original tumor has undergone the change into sarcoma the consistency of the tumor is soft and marrow-like. The cut surface is opaque and its appearance has been compared to fish flesh. There are in places hemorrhages and areas of degeneration. As a rule, the sarcomatous degeneration is not complete and the sarcomatous tissue presents a marked contrast to the pale-red, firm, striated tissue of the myoma. Most often we find the sarcoma surrounded by a capsule of myomatous tissue, but the change may have occurred in an irregular manner; even in such a case one can usually see the line of demarcation between the two. Where the sarcoma has invaded the uterine muscle the same sharp boundary between the two usually exists.

The new-growth can attain an enormous size and in form is more or less that of the original myoma. As it grows it tends to take on a globular form. The mucosa of the uterus over the tumor is retained for a long time. When the tumor has the polypoid form it tends to undergo degenerative changes and break down much sooner than in the other varieties. The tumors which contain a large amount of connective tissue break down later than those rich in cellular elements. When the new-growth is submucous the uterus is more or less symmetrically enlarged. The uterine walls may hypertrophy or from the stretching become very thin and thus give rise to complete inversion of the uterus, which has been observed in a few cases. Where the tumor is interstitial or subserous the form of the uterus is in nowise different from that brought about by a myoma lying in the same situation. The tumors usually have a rich blood supply, but degenerative processes may lead to hemorrhages into the tissues. Cystic, fatty, hyaline, and myxomatous changes of the tumor also occur. These degenerative changes cause the consistency of the tumor to be softer, so that it may feel on palpation like a pregnant uterus.

Primary sarcoma of the uterine wall, as has been stated, is at times very difficult to distinguish from a sarcoma originating in a fibromyoma. Their occurrence is comparatively infrequent, but some observers believe that they are not so rare as is now thought. Several cases, however, have been reported where no doubt can exist that the tumor

originated in the uterine muscular wall. Deale[1] and Cullen[2] have reported cases of primary sarcoma of the uterine wall. In these cases the limits of the sarcoma were fairly well defined. No doubt can exist in certain cases where large portions of the entire uterine muscle is infiltrated with irregularly outlined masses of sarcomatous tissue. The form of the uterus in primary sarcoma is, as a rule, more symmetrical, and its consistency is softer than where parts of myomata are present.

According to the form of the cells of sarcoma the uterine wall is divided into *spindle-cell sarcoma* and *round-cell sarcoma*, the former occurring about four times as often as the latter. The spindle-cell sarcoma is seldom a pure variety, but contains an admixture of round cells. The size and character of the cells are, as a rule, those of sarcoma in general. Giant cells have occasionally been observed. Fibro-sarcomata have in a few instances been observed, the histology of the tumor resembling markedly a fibroma rich in cells. The name *myoma-sarcoma* has been given to tumors in which the muscle cells have been transformed into sarcoma cells.

Symptoms.—Sarcoma of the uterine wall causes symptoms which resemble in most respects those of a myoma, so that attention will be called chiefly to the differences.

HEMORRHAGE.—In both myoma and sarcoma the menses are usually increased in amount; there may be bleeding between the periods and in both kinds of tumors the menstruation may be prolonged beyond the usual age when the menopause usually occurs. With a fibromyoma after the menses have once ceased it is rare that hemorrhage begins again and its occurrence points strongly to the existing fibroid having undergone a sarcomatous degeneration. Likewise, a fibromyoma after the menopause tends to cease growing, so that a rapid increase in size would indicate a sarcoma, although a rapid growth is not observed in all sarcomata, and is occasionally present with a fibromyoma.

CACHEXIA.—Cachexia is often an early symptom in sarcoma and is frequently seen without marked loss of blood. This is seldom or never the case with a fibromyoma. The general symptoms are usually more marked with sarcomata than with myomata; headache, lassitude, loss of appetite, sleeplessness, a feeling of pressure or pain in the lower abdomen; vesical and bowel symptoms are more pronounced. When the tumor is submucous there is a blood-stained vaginal discharge in both, but in sarcoma there is a greater tendency to breaking down of the tumor. The fibroid may suppurate or be expelled from the uterus, but seldom do we see portions of the tumor discharged in large masses, as is the case frequently with sarcoma. *Pain* may be a marked symptom when the tumor is submucous and the uterine contractions tend to extrude it from the cavity or when the peritoneum, broad ligament, bowel, or bladder becomes invaded by the neoplasm.

Metastases tend to occur late in sarcoma of the uterine wall. Gessner, however, states that in 33 autopsies upon patients with this form of

[1] American Journal of Obstetrics, vol. xxxi., p. 206.

[2] Cancer of Uterus, 1900, p. 551.

tumor metastases were found in 24 of them. They occurred in almost every part of the body and generally took place through the circulation. The lungs were involved 15 times; the liver, 10 times; the intestines, 8 times; the omentum, kidneys, and pleura, 4 times each; the retroperitoneal glands, 4 times, etc.

The length of life is variable, but is somewhat longer than with sarcoma of the uterine mucosa.

Diagnosis.—It is impossible to diagnose with certainty a sarcoma of the uterine wall without the aid of the microscope. As the microscopic examination is made, as a rule, after the removal of the tumor it is most important to bear in mind all points which would suggest a sarcoma. That a considerable number of supposed myomata contain sarcomatous elements has been definitely shown by the routine examination in some clinics of all tumors of the uterus. Martin of Greifswald in 205 myoma operations found the supposed myomata to have undergone sarcomatous degeneration 6 times, and Hauber in Klein's clinic in 138 myoma cases found 3 of them sarcomatous.

Gessner has summed up the above-mentioned indications in Veit's *Handbuch* as follows: One should suspect that a sarcoma of the uterine wall is present.

1. When a tumor having the character of a myoma does not cease to grow after the menopause.
2. When such a tumor some time after the menopause gives rise to hemorrhage.
3. When with such a tumor a marked cachexia arises.
4. When with such a tumor general symptoms arise which neither the size nor the situation of the tumor would usually cause.
5. When with such a tumor ascites which is referable to the tumor occurs.
6. With a rapidly growing, soft, or semi-fluctuating myoma.
7. When after the removal of fibrous polyp it recurs.

The last-mentioned cases are of considerable importance. Several cases have been reported where such a polyp has been repeatedly removed and subjected to a histological examination each time, and only at the last examination has it shown signs of malignancy. In cases of recurring fibrous polypi the uterus should be removed even if the microscopist does not make a diagnosis of sarcoma.

Treatment of Sarcoma of the Uterus.—As in carcinoma so in sarcoma does the treatment naturally divide itself into two classes: (1) inoperable, and (2) operable cases.

The inoperable cases are those which either from weakness, heart, lung, kidney disease, etc., would not withstand an operation, or in which the sarcoma has extended so widely that there is no hope of a total extirpation. All other cases belong to the second class.

Operable Cases.—The treatment here consists in the complete hysterectomy with removal of the tubes and ovaries. The method of operating depends upon various circumstances. As a rule, we can say that in small tumors of the uterine wall and in practically all tumors

of the uterine mucosa the *vaginal* hysterectomy is to be preferred. This is especially the case where the tumors have undergone necrotic changes. In large tumors of the uterine wall the abdominal hysterectomy is to be preferred. The vaginal operation gives a lower immediate mortality, the convalescence is more rapid, and as the sarcoma does not tend to spread along the lymph channels, there is not the same indication for the removal of the lymph glands as in carcinoma. In a few cases where the uterus has been much enlarged and in sarcoma of the endometrium or the submucous variety of sarcoma of the uterine wall, and where the tumor had undergone necrotic changes, the operator has scraped away most of the tumor and then given ergot or some other oxytocic. The uterus has contracted to a small size and rendered the vaginal hysterectomy easy. In case the sarcoma is undergoing suppurative and necrotic changes the cervix should be closed and the vagina disinfected thoroughly before beginning the hysterectomy. The technique of the operation is very much like that for carcinoma of the uterus. It is not permissible to remove the uterus in segments if it can be helped.

The abdominal complete hysterectomy should be done in cases where the tumor is large and is indicated in most cases of subperitoneal or interstitial sarcoma. At times the condition of the patient forbids the complete hysterectomy, and then the amputation at the cervix must be performed with a subsequent removal of the stump *per vaginam.* The latter procedure is indicated when after supravaginal amputation the myoma is discovered to have undergone sarcomatous changes. The technique of the operation is practically that for myomata except that the appendages of the uterus should be removed in all cases.

INOPERABLE CASES.—The treatment in these cases is largely symptomatic. When the sarcoma is breaking down and being extruded through the cervix, the condition of the patient can generally be improved by the removal of most of the tumor by means of the curette. Ergot is, at times, indicated to check the hemorrhage. The same general measures with regard to food, douches, pain, etc., as applied to uterine carcinoma, are indicated in sarcoma. The cases where the condition of the patient precludes the hope of recovery from the operation necessary to remove an operable sarcoma are most important. As the delay of a short period of time may allow such an extension of the new-growth as to render its entire removal impossible, it becomes a very important question just what risk it is justifiable to take in attempting a radical cure. In heart and kidney disease one should not, as a rule, wait many days, and even though the chances be against an immediate recovery, the operation in cases offering a good hope for a total extirpation should be attempted. When from loss of blood, cachexia, general weakness, one may delay a short time after stopping hemorrhage or checking decomposition to build up the strength of the patient.

The *results* of operative treatment of sarcoma of the uterus have not been determined with any degree of accuracy. In Gessner's statistics in 26 cases of sarcoma of the endometrium, 16 cases had remained well.

Their observation after operation had extended over the following periods of time after the operation:

One to two years	4 patients.
Two to three years	5 "
Three to four years	1 "
Five to six years	1 "
Six to seven years	2 "
Seven to eight years	2 "
Eleven years	1 "

In sarcoma of the uterine wall in 35 cases, 21 had remained well for the following periods:

One to two years	11 patients.
Two to three years	2 "
Three to four years	3 "
Four to five years	1 "
Six to seven years	2 "
Seven to eight years	2 "

Carcinoma and Sarcoma in the Same Uterus.—The simultaneous occurrence of carcinoma and sarcoma in the same uterus is very rare.

FIG. 230

Uterus containing polypoid masses of sarcoma and carcinoma without evidence at the cervix. Arch. f. Gyn., 1904.

Only a few cases have been reported. Klein, Niebergall, Emanuel, Iwanoff, Montgomery, Opitz, Nebesky, and Fry have reported undoubted cases of the kind. Klein's case was that of a fibrous polyp which had undergone sarcomatous degeneration along with an adeno-

carcinoma of the corpus uteri. The cases of Niebergall and Iwanoff were sarcoma probably developing from submucous myoma with adenocarcinoma of the body of the uterus. In Emanuel's case a polypoid sarcoma and an adenocarcinoma of the body of the uterus had existed in the same patient. H. D. Fry exhibited a uterus before the Washington Obstetrical Society April 1, 1904 where a carcinoma of the cervix was present in a myomatous uterus. A myomatous nodule had undergone sarcomatous degeneration. Opitz's patient had a polypoid spindle-cell sarcoma of the uterine mucosa and an adenocarcinoma springing from another portion of the endometrium of the corpus uteri. Nebesky[1] reports a very interesting case where the sarcoma and carcinoma existed in the same portion of the mucous membrane.

FIG. 231

Same as Fig. 230, magnified. Carcinomatous columnus in sarcoma with overgrowth of the cylindrical epithelial cells in the squamous epithelium. In the vicinity of an obliquely severed blood-vessel is a bundle of giant cells.

Sarcoma and Pregnancy.—The occurrence of pregnancy in a sarcomatous uterus is extremely rare, Gessner in 1899 having been able to find only 6 cases in the literature. Of these cases 4 were sarcoma of the cervix and 2 sarcoma of the uterine wall.

The symptoms are the same as in sarcoma uncomplicated with pregnancy only, perhaps, increased on account of the large blood supply. The remarks made on sarcoma as regards diagnosis and prognosis apply here.

[1] Archiv f. Gynäk., Band lxxiii., Heft 3.

The management of such cases depends as in carcinoma upon the month of pregnancy and the extent of the involvement of the tissues. In early stages of the disease the principle upon which we should act is to save, if possible, the life of the mother without regard to that of the fetus. When there is no hope of recovering the mother then our efforts should be directed to saving the life of the child.

The choice of the radical operation will depend, as in carcinoma, upon the size of the uterus. Up to the fifth month the vaginal hysterectomy is the easiest. After that month of pregnancy the choice lies between the abdominal Cæsarean section with subsequent removal of the uterus by either the abdominal or vaginal route or the so-called "vaginal Cæsarean section," followed by vaginal hysterectomy.

When in labor the procedure indicated will depend upon the amount of dystocia caused by the new-growth. In one case it was deemed necessary to do a Cæsarean section. In most of the few reported cases the labor has terminated spontaneously. If the case be favorable for a radical cure the hysterectomy can be either immediately performed or one can wait a few weeks, depending largely upon the condition of the patient.

In any stage of the pregnancy when there is no hope of cure our efforts should be directed to preserving the strength of the mother so she can bear a living child. Curettage, douches, etc., are indicated in sarcoma of the cervix where there is much hemorrhage or a foul discharge. General measures, such as nourishing food, narcotics, etc., are indicated.

ENDOTHELIOMA OF THE UTERUS.

This is a very rare disease, 14 cases only having been reported.[1] Endothelioma is a malignant new-growth having its origin in the endothelial cells of either the blood-vessels or lymph-vessels. Of the reported cases, 9 originated in the cervix and the remainder in the corpus uteri.

Histology.—The macroscopic appearance of the tumor closely resembles that of carcinoma. The microscopic appearance in its general structure likewise bears a marked resemblance to adenocarcinoma. It consists of numerous tubules or alveoli penetrating the tissue in various directions. These tubules "sometimes form long sinuses and show some branching, but as a rule they appear as round or oval spaces, which in many places are so abundant that the tissue looks not unlike portions of a lung in which there has been considerable increase of connective tissue" (Cullen). The cells of the tubules are in places one layer in thickness, while in others they may form many layers. They resemble frequently carcinoma cells showing great variation in

[1] Kirchgessner. Zeitschr. f. Geb. u. Gyn., Band xlix., Heft. 2.

form, size, and staining qualities. The transition of the endothelial cells of the blood-vessels or lymph-vessels into the tumor cells is shown in places and is necessary to make the diagnosis.

Diagnosis.—The diagnosis can only be made by a microscopic examination of the tumor.

Symptoms and Treatment.—The symptoms and treatment are the same as in carcinoma.

CHAPTER XVIII.

THE VAGINAL METHOD OF OPERATING.

By J. RIDDLE GOFFE, M.D.

DIFFICULTIES AND ADVANTAGES; ITS SCOPE AND TECHNIQUE.

When the vaginal method of attacking pelvic diseases was first suggested many difficulties and objections presented themselves to the minds of the older operators. In all advances into new fields, many dragons beset the path, and many horrors loom up in the imaginations of the timid and conservative.

Thus has it been with the vaginal method. Foremost among the objections was the apparent impossibility of rendering the vagina aseptic; the vagina seemed too small a space to permit of the work being accomplished; it was working in the dark, etc. Experience has gradually vanquished all these difficulties and has demonstrated that the vagina can be made as thoroughly aseptic as the field of operation in abdominal section. The vaginal introitus when opened with specula and retractors is fully as large as many abdominal incisions, and lets in all the light necessary and affords all the view required to do the work that should be legitimately undertaken.

Method of Cleansing the Vagina.—The skin of the vulva and external parts is subjected to the same preparatory treatment as the skin in any other portion of the body. The pubis is shaved and a green soap poultice is applied for two hours. The parts are then thoroughly washed and a bichloride of mercury dressing applied and continued from six to eight hours, being left in place until the patient is put upon the operating table. Previous to this the vagina is douched with normal saline solution, followed by a solution of bichloride of mercury, 1:4000. It is then packed with 10 per cent. iodoform gauze, which is left in place until the time of operation. Upon the operating table after the patient has been anæsthetized all these dressings are removed, the catheter is passed to assure the complete evacuation of the bladder, the external parts are again scrubbed with green soap and a brush, and the vagina likewise. For this purpose a long, narrow brush is used, such as jewellers use to polish their wares. The brush is saturated with tincture of green soap, and with one or two fingers inserted into the vagina as retractors, the canal is scrubbed from its cervical attachment to the vulva. Not only is the to-and-fro motion applied, but the brush is swept round and round, allowing the bristles to follow the grooves between the rugæ. It is not necessary to use such force as to denude

the vagina of its epithelium; indeed, that is not desirable. The scrubbing is continued for five minutes with a gauze swab in a dressing forceps or sponge holder, using sterile water followed with bichloride. The vagina, vulva, and all the external parts are then flushed with an abundance of sterile water from a pitcher. During the operation a douch of normal saline solution and of bichloride of mercury 1:4000 are kept constantly ready to flush the vagina and immediate field of operation in the event of any septic or suspicious material being dislodged. In case of gonorrhœal infection of the vagina or vulva a preliminary treatment with the various silver salts may be necessary, along the lines prescribed for such conditions. In cancer of the cervix it may be advisable to curette or excise the cervix at a preliminary séance and pack the vagina for some days with iodoform or other gauze. Experience has demonstrated that these precautions render the vaginal field of operation even more aseptic than the abdominal. No one claims that the deeper layers of the skin can be made aseptic with any degree of certainty. This is shown by the frequent stitch-hole abscesses occurring after abdominal section.

In the majority of women who come for operation—*i. e.*, multiparæ, the vaginal introitus when stretched by speculum and retractors affords as large an opening for sight and manipulation as is obtained by four-inch or five-inch abdominal incision, and yet that is deemed quite large enough for all ordinary work in the pelvis. It is difficult for the novice to realize this, but a little experience quickly demonstrates the fact. In nulliparæ and virgins a narrow introitus can be readily enlarged by a lateral incision through the constricting tissue on one or both sides of the vagina. Usually one incision proves sufficient, the opening being then stretched by pressure upon the perineum. After the section is made into the pelvic cavity, whether this section is posterior or anterior, retractors open to view the contents of the pelvis, through an opening which may be expanded to the full diameter of the pelvis. It is true that when the hand or fingers are inserted for manipulation the field is more or less obstructed, and dependence has to be placed upon the sense of touch. But this is true in many manipulations through the abdominal incision and, indeed, through any incision into a cavity of the body—as for instance, in operation upon the kidney, the gall-bladder, the bile-ducts, the prostate gland, and even the brain. To be sure, sight is depended upon in many instances to determine the relations before the fingers are introduced, but frequently the sense of touch is the only guide and the fingers go where sight cannot enter.

The *tactus eruditus*, therefore, is an important faculty or sense to the surgeon in every department of work. It is particularly so to the gynecologist, for his diagnosis depends almost exclusively upon this faculty. It is an error to ascribe the *tactus eruditus* to any unusually developed tactile corpuscles in the ends of the finger. It resides in the brain and consists in the faculty of making a mental picture through the sense of touch. It is a habit capable of the most perfect cultivation. It is in

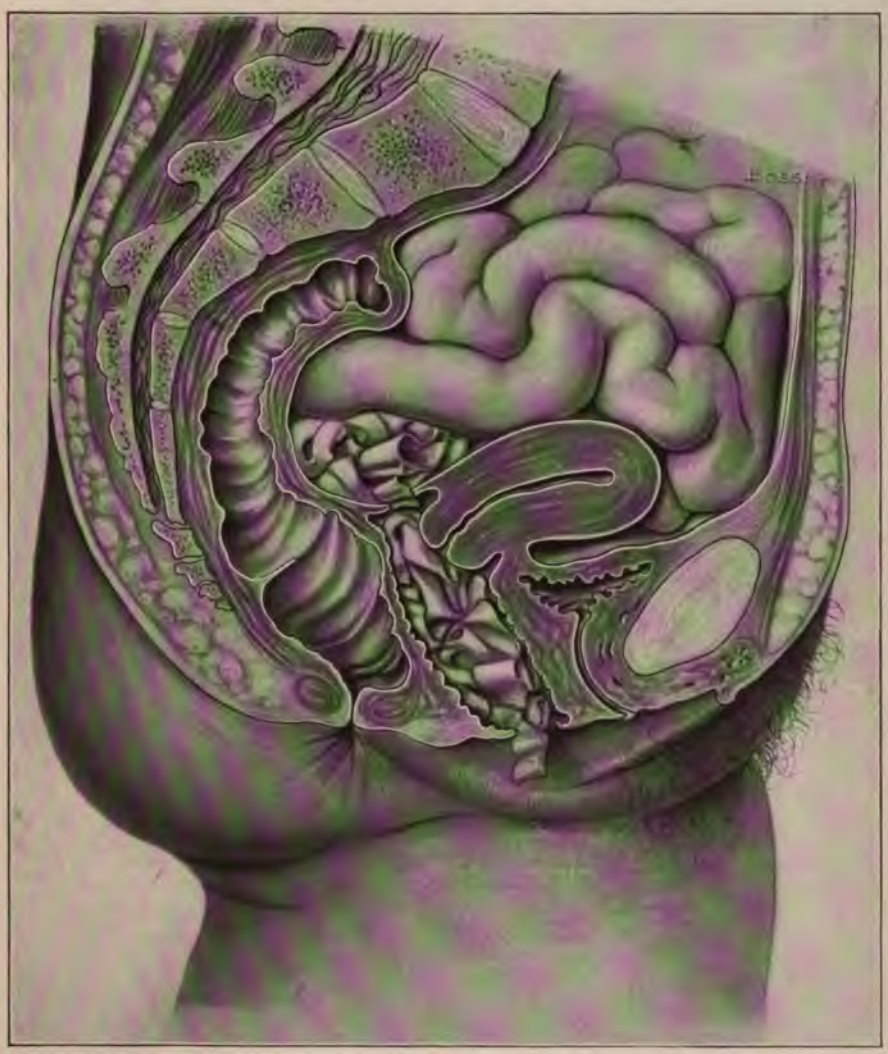
this way that the blind are taught to read. When a blind person passes his fingers over the page of raised letters, the mental picture that he forms is just as distinct and clear as though he had seen it with his eyes. In this way the surgeon, and especially the gynecologist may acquire such acute powers of discrimination that he can readily differentiate the various tissues with which his finger comes in contact. In this way the female pelvis to his touch becomes an open book, and his fingers guide him sometimes with even greater accuracy than could the sense of sight, so that the objection that the method of vaginal section is work in the dark, falls to the ground.

Some operators prefer and confine themselves to the posterior vaginal section, not only for incising abscesses and for making diagnosis, but also for doing whatever work is necessary upon the uterine appendages. This, of course, is exclusive of hysterectomy. The anterior vaginal incision, however, affords greater facility for such work as shortening the round ligaments for retrodisplacement, or vaginal fixation, and for conservative work upon the ovaries and tubes. Through this incision the scope of the work has been extended to include operations for the relief of all conditions confined to the true pelvis.

As a route of attack in dealing with collections of pus, vaginal section suggests itself at once on account of the natural drainage which is thereby afforded. Drainage in such cases is the all-important consideration. This was appreciated by the earliest operators, who simply punctured with a trocar or other pointed instruments through the vagina. It is now recognized by the best operators that vaginal puncture is both dangerous and unsatisfactory; dangerous because of the liability to injure large bloodvessels and intestines, and unsatisfactory because of insufficient drainage. Hemorrhage from a puncture is usually concealed and therefore dangerous because not discovered. The wound being a puncture wound and small, closes promptly and prevents the escape of the pus. These objections have been overcome in more recent times by exposing the parts well by vaginal speculum and retractors and making a free incision as in attacking an abscess in any other part of the body. Any hemorrhage is thereby discovered and controlled, and drainage is maintained until the cavity is healed. The success of this method in dealing with simple conditions has gradually extended its application, until it is confidently maintained by those who have familiarized themselves with it, that any pathological condition confined to the true pelvis can be dealt with as promptly, as thoroughly, as satisfactorily, and with less danger than any other way. Its scope embraces such conditions as ovarian abscess, tubo-ovarian abscess, salpingitis, abscess of the broad ligaments, ectopic pregnancy, displacements of the uterus, fibroid tumors, inversion of the uterus, cystocele, and Cæsarean section. Vaginal hysterectomy has long been recognized as a standard operation.

The Technique of Vaginal Section.—There are two distinct incisions recognized for the work, one is posterior and the other anterior to the cervix of the uterus. Some operators find it advantageous to use both

PLATE XXXVII.



Method of Packing Douglas' Pouch for Drainage in Cases of Pelvic Abscess.

in dealing with an individual case. The position of the patient upon the table and the general preliminary arrangements are the same for both. The patient is placed upon her back with the buttocks slightly projecting over the end of the table and her feet elevated in the stirrups. The small-sized Kelly pad placed under the sacrum, the apron hanging at the end of the table, is of great service in keeping the patient, the table, and the coverings dry and clean. A vaginal retractor is inserted into the vagina, the cervix grasped with strong traction forceps and sufficient traction made to put the vaginal wall about the cervix upon the stretch.

VAGINAL SECTION FOR PELVIC ABSCESS.

The extent of the inflammatory processes and the firmness of the adhesions necessarily limit the mobility of the uterus and the extent to which it can be drawn down.

It may be perfectly immovable and the cervix forced into some distorted position and quite out of sight. Under these circumstances the abscess will protrude into the vagina and the point of incision clearly indicated. It must not be forgotten, however, that abscesses that bulge into the vagina posterior to the cervix have their origin in the ovaries or tubes and are intraperitoneal. As they gradually force their way down the peritoneum lining, Douglas' pouch is carried down in advance even to the extent of dissection into the vaginorectal space. In very large abscesses this reaches its limit and the anterior rectal wall is doubled on itself in front of the abscess, and unless the incision is made near to the cervix—*i. e.*, above the point of attachment of the peritoneum to the vagina—the rectum may be incised and a rectal fistula made. The rule is, therefore, to incise the vagina close to the cervix, even when it may not seem to be the most dependent point of the abscess. These tissues are resilient, and after the pressure is removed the peritoneal pouch tends to resume its original position and drainage will actually be from the most dependent portion of the sac. The incision may be made transversely or in the median line longitudinally. The incision should be short, sufficient only to admit the index finger or a Sims uterine dilator, which is then inserted and the tissues torn and stretched to the extent of two inches or more. If the abscess presents at either side, the danger from making an incision arises from the proximity of the ureters and the uterine arteries. The arteries can usually be located by their pulsation, and they should be carefully palpated to determine their location. The ureters come obliquely forward on either side of the cervix and enter the bladder about one inch from the median line and about an inch and a half anterior to the cervix. An incision anterior to their point of entrance into the bladder and an inch and a half from the median line will be free from danger as far as the ureters are concerned, and in the great majority of cases would be anterior to the uterine artery. If the abscess has come down posterior to the uterine artery and crowded it to the front the incision is best

made in the median line posteriorly into Douglas' pouch and the abscess penetrated through this opening. If, however, the abscess is in the cellular tissue of the broad ligament, it is best reached by an incision directly over where it points, care being exercised not to injure the uterine vessels or the ureter.

When once the abscess has been entered and pus appears it is safer to tear the tissues than to incise them. There is less bleeding and bloodvessels and other structures are forced to one side out of harm's way. The abscess is then treated on general principles. It is irrigated by any suitable antiseptic, such as normal saline solution, peroxide of hydrogen, or bichloride of mercury solution, 1: 3000. The cavity is then packed with sterile gauze or a drainage tube inserted as may please the fancy of the operator. If the cavity has numerous lobules or pockets it is always wise at the time of operation to pack it firmly with gauze. This obliterates the pockets and produces one large cavity, thus ensuring more perfect drainage. The packing may be repeated as many times as may be necessary to ensure the continuance of the condition, and then the drainage tube inserted. If the tube has a tendency to slip out, it may be fastened by a silk stitch to the edge of the wound. Through this tube the cavity is irrigated two or three times a day, according to the efficiency of the drainage and the amount of the discharge. As soon as the temperature has reached normal and the patient's strength permits, she should be gotten out of bed and on her feet. There is no objection to her going about with the drainage tube in place. Drainage is facilitated thereby and convalescence hastened. In the mean time the general health must be improved by nourishing diet and appropriate tonics.

ANTERIOR VAGINAL SECTION.

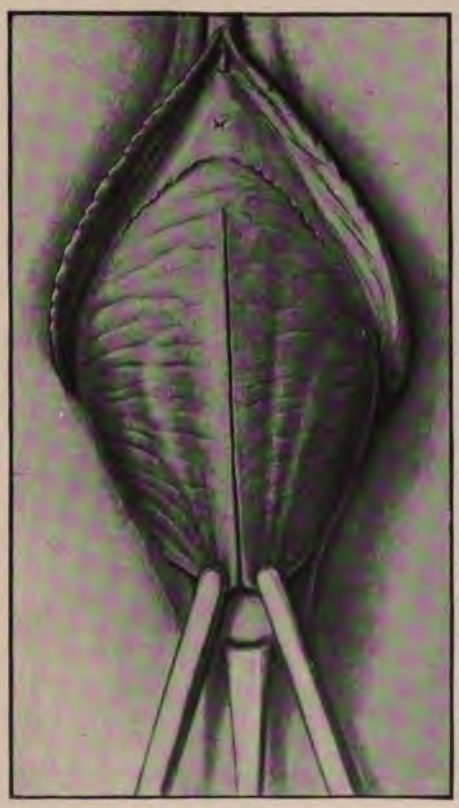
Anterior vaginal section affords greater facilities for operative procedures than the posterior and the one that is generally used by operators who practice the vaginal method. The posterior incision is frequently used in connection with it to afford additional opportunity for the purpose of simply securing drainage, and in some cases for manipulation. Briefly, the procedure consists in making a transverse incision in front of the cervix corresponding to that employed in complete vaginal hysterectomy. Through this incision the bladder is dissected from the uterus up to the peritoneal fold. The peritoneum may then be incised and the peritoneal cavity opened, or that can be left until the next step in the process is completed, which consists in making a longitudinal incision through the vaginal mucous membrane and sheath throughout its entire length (Fig. 232). This is accomplished by grasping the edge of this transverse incision either side of its middle point by two artery clamps. Tension upon these clamps puts the anterior vaginal wall upon the stretch, and an incision is made with the knife from the neck of the bladder down to the centre of the transverse incision. The

PLATE XXXVIII.

Method of Packing the Pelvis with Gauze after Removal of Large Ruptured Pus Tubes attended with Extensive Adhesions.

bladder is then dissected off the vagina for the distance of an inch or an inch and a half either side of this longitudinal incision. The purpose of this second incision and the separation of the bladder is to secure sufficient room in which to work. The dissection is done almost exclusively with the handle of the scalpel and the finger, and the hemorrhage is inconsiderable. Through this opening, whether in virgin or multipara, ample space is afforded for whatever radical or conservative work upon the uterus and its appendages may be indicated. This becomes at once

FIG. 232



The longitudinal incision in anterior vaginal section.

apparent when we consider that the vaginal cleft—*i. e.*, the introitus vaginæ—is quite as large as the usual abdominal incision of a laparotomy, and by this T-incision in front of the uterus the opening into the peritoneal cavity duplicates the size of the introitus.

The simplest and at the same time very important function which is subserved by an incision into any of the large cavities of the body is that of an exploratory operation. An exploratory incision, as far as possible, should be free from danger; should give facilities for gaining

the desired information, and at the same time afford opportunity for the completion of such surgical procedures as may be indicated.

The anterior vaginal incision fulfils these functions most satisfactorily. 1. It is free from danger; more than that, it is devoid of any untoward or annoying consequences. The tissues through which the opening is made seem to be unusually tolerant of traumatic interference, and the generous blood supply of these parts favors prompt and complete healing. 2. As an exploratory incision it affords the means of accurate, definite, and reliable information in regard to the entire contents of the pelvis. 3. The third condition is an important one, and experience is constantly widening the field of its application, and demonstrating that it affords ample space for completing almost every surgical procedure that may be indicated.

In cases of displacement of the uterus the ligaments and the ligaments alone are the proper tissue to utilize in restoring and maintaining the uterus in its normal position. The success attained by the Alexander operation of shortening the round ligaments at the external ring, and by the Wylie-Mann operation of shortening the round ligaments intraperitoneally, and the multiplicity of devices for utilizing the round ligaments for this purpose is ample assurance of the efficiency of these ligaments for this purpose. In this connection we recall the Kellogg, Dudley, Goldspohn, Gilliam and many other operations.

The plan of procedure consists simply in shortening the round ligaments inside of the pelvis; but it is done through the anterior vaginal incision. The technique is as follows: After entering the peritoneal cavity, the uterus is dragged down firmly by traction forceps attached to the cervix, and the finger passed over the fundus and slipped along until it hooks over the broad ligament near the uterus. The round ligament near to its origin from the uterus is then seized between the index finger, which is on the posterior face of the broad ligament, and the thumb, which is anterior. The cervix is now pushed into the posterior fornix and the traction forceps removed, the cornu of the uterus in the meantime being dragged forward and downward into the vagina. The bladder and vagina are pushed up by a retractor or the index finger of the other hand, and by a little persistent effort the entire uterus is delivered into the vagina. In accomplishing this manœuvre it is not necessary to catch the fundus with a volsellum forceps, tenaculum, or other pointed instrument. They tear the peritoneum and give a point for future adhesions; sometimes cause annoying hemorrhage. As a rule the fingers are the only instruments necessary. If a little firmer grip is desirable, the ovarian ligament near to the fundus may be grasped by a sponge forceps (Fig. 233). This ligament is strong and fibrous and affords a very good hold. The round ligament, first of one side, then of the other, is caught by an artery clamp from one to two and a half inches from the horn of the uterus and dragged down in the form of the letter U (Fig. 234). A fine twisted silk suture is now passed through the ligament at a point on the outer side of the forceps and then near to the uterus. The point selected at the outer side of the forceps is at as

remote a point as will allow of approximation to the second point through which the stitch is passed near the horn of the uterus. It is then tied, thus shortening the round ligament to an extent equal to the length of tissue taken up in the loop. The two arms of the loop between this suture and the forceps are then stitched together and to the round ligament near the uterus by two sutures of silk, and finally a third one

FIG. 233

Acute salpingitis, showing the enlarged tube and the method of holding the uterus by the ovarian ligament; a part of the ovary is also in the grasp of the forceps.

catches the tip of the loop and attaches it to the anterior face of the uterus just at the origin of the round ligament. This latter suture is simply for the purpose of disposing of the loop of tissue, although it doubtless affords an additional support. The horn of the uterus thus treated is allowed to resume its position in the pelvis. The other horn of the uterus is drawn down and the round ligament of that side treated as in the first instance. The uterus is then allowed to take its normal

posture of anteversion in the peritoneal cavity and the bladder tissue is adjusted to its original position. Two catgut sutures sew up the transverse incision in front of the cervix, and interrupted catgut sutures restore the vagina along the longitudinal incision. The vagina is then packed with gauze and the operation is complete.

Cases of retroversion complicated by adhesions, either of the uterus or of the appendages, are made to conform to this technique after the adhesions have been broken up by the finger. Where the adhesions extend to the bottom of Douglas' pouch and are difficult of access a posterior vaginal incision is made, and through this the separation of the adhesions is completed.

Speaking from his own experience, although like most of us he has had more or less experience with all the operations that have been suggested for the relief of displacements, the author has not found one that has given him such universal satisfaction as shortening of the round ligaments through the vaginal incision. So far as known there have been but three failures in a series of over 200 cases, and these were due to some departure from the regular procedure in which a modification was attempted. Among the 200 cases, 8 private and 4 charity patients are known to have become pregnant, 10 have gone to full term, pregnancy proceeding most comfortably and satisfactorily, and the uterus retaining its proper position thereafter. Doubtless many others have borne children since the operations, but have not reported. Of the miscarriages one was in a syphilitic negress, and in the other the cause could not be learned.

The most frequent cause of retrodisplacement of the uterus is suppurative disease of the appendages, involving from 75 per cent. to 80 per cent. of all cases coming under observation requiring surgical interference for this affection. Because of these complications the Alexander operation, pure and simple, is applicable to an extremely limited number of cases; it becomes necessary, therefore, in order to treat the remaining cases satisfactorily and effectively to open into the peritoneal cavity, and the question is, Shall it be done through the abdomen or shall it be done *per vaginam?* The advantages of the vaginal operation are that the healing process goes on unconsciously to the patient without any more constitutional or local disturbances than attend a simple trachelorrhaphy. The patient is not mindful of having had an incision made nor does she bear upon her person any trace of a surgical operation. There are no adhesive plasters to be applied, no stitches to be removed, no bandage or supporter to be worn; there is no ugly scar, and there is no danger of a future hernia.

This procedure has its most appropriate application in cases of congenital or acquired retrodisplacement in unmarried women. Among the author's cases are 18 of congenital retroversion or flexion in unmarried women, whose ages range from nineteen to twenty-seven years. In these cases, although the vagina was small and the hymen intact in all of them, he was able to perform this operation and effected a cure. In most of these cases it was necessary to incise the vagina on one or

both sides at the seat of the hymen, extending the incision one or two inches into the canal.

The condition in cases of congenital displacement is rather peculiar. In them the uterovesical ligament is shortened, the uterosacral ligaments are lengthened, and the cervix is drawn forward into the axis of the vagina. The anterior vaginal wall, too, is attached low down on the

FIG. 234

Shortening the round ligament, first suture.

anterior lip of the cervix, thus drawing down the short arm of the lever (the cervix) and throwing the long arm or fundus back into the hollow of the sacrum. The operation through the anterior fornix necessarily severs the uterovesical ligament at its attachment to the cervix and sets the latter free, so that it swings back into the hollow of the sacrum and allows the fundus to come to the front. In these cases in closing the

vaginal incision, after the round ligaments have been shortened, the attachment of the anterior vaginal wall is carried up on the anterior face of the uterus. This brings the pull of the uterovesical ligaments nearer the long arm of the lever, the fundus, where it normally belongs.

Congenital cases of retrodisplacement are notoriously difficult to cure, but with these combined procedures results have been uniformly successful, all the cases now being under observation for periods ranging from ten to two years. These women bear no mark upon their persons of having been submitted to an operation, except that the hymen has been destroyed.

RESECTION OF TUBES AND OVARIES.

It is customary always in these cases, after delivering the uterus into the vagina, to bring down the appendages also, first one side and then the other, and do such conservative work upon them as their condition indicates. This work consists of such procedures as puncturing multiple cysts of the ovaries with a Paquelin cautery, in some cases resecting portions of the ovaries, at the same time freeing the Fallopian tubes from adhesions, opening up the fimbriated ends, and, under a stream of normal saline solution, massaging the tubes, squeezing out any retained secretions, probing the tubes to discover their patency or constriction, disinfecting them with pure carbolic or tincture of iodine on a probe, and when necessary amputating them at a point that will afford a patulous tube from there on to the uterus. Work in this department of conservation of tissue and function of the ovaries and tubes in connection with shortening the round ligaments has been most satisfactory.

In cases of pyosalpinx where the tube is hopelessly destroyed the greatest facility is afforded for dissecting out the tube from the horn of the uterus and closing its bed with sutures. The fundus lies in the introitus vaginæ, where the tube and ovary are easy of access and one or both can be taken off by the angiotribe or by ligature. If the tube is dissected out of the horn of the uterus its bed is closed by sutures. The author's cases illustrate all forms of complications, from the simple removing of diseased appendages through the whole range of conservative procedures to the removal of the products of conception in ectopic pregnancy, dermoid cysts, myomectomy for small fibroids, and hysterectomy by morcellation for large fibromyomatous tumors.

It is a nice question to determine how far active surgical interference is advisable in cases of acute infection of the uterine appendages. Polk, Pryor, and Henrotin have advocated and practised opening of the cul-de-sac and drainage in cases of threatened or early involvement of the appendages as a prophylactic or function-saving procedure. It is possible and justifiable by the vaginal route to go a step farther, and even in the acute stage do conservative work upon the uterine appendages.

The two following cases of acute salpingitis with constitutional symptoms, one of which had reached the stage of pus formation, a tubo-ovarian abscess of one side and acute salpingitis of the other side, illustrate the comparative immunity attending the vaginal method and the gratifying convalescence due to the free drainage thereby afforded:

CASE I.—Mrs. S., the mother of two girls, six weeks after her second confinement was infected with gonorrhœa. Six weeks later she entered one of the large New York hospitals, where she was told that the only thing that would cure her was the removal of her uterus and appendages—a panhysterectomy. To this she would not consent, because, as she said, she wanted a boy baby. She therefore left and through an acquaintance with some of my hospital clientéle came to me at the Polyclinic. She had a temperature of 101°, a foul tongue, irritable stomach, a mass as large as one's fist involving the left appendages, and a large adherent tube on the right side, also an effusive leucorrhœa. I told her I thought it very probable that I could save the right ovary and tube if the operation were done promptly, and if I were successful it would be possible to secure her longed-for boy. She consented. The uterus was thoroughly curetted, swabbed with pure carbolic acid, and packed with iodoform gauze. The cul-de-sac was opened, adhesions gently severed with the finger, and some iodoform gauze carried up to the promontory of the sacrum. Then the anterior incision was made, the balance of adhesions surrounding the inflammatory mass separated, and the fundus of the uterus delivered into the vagina. The appendages which were the less involved were then drawn down, the tube found enlarged, inflamed, occluded, the fimbriæ being adherent to the ovary. Under an irrigation of hot saline solution the ovary was washed; the fimbriæ were massaged and opened out; the contents of the tube, consisting of a few drops of mucopus, were milked out, and a silver probe loaded with tincture of iodine carried into the tube its full length. The fimbriæ and ovary were also brushed lightly with iodine. These were replaced and adjusted upon the gauze which had been inserted in the cul-de-sac. The involved mass of appendages of the left side were then brought down to the vulva and a collection of pus involving the ovary and tube was set free and the appendage removed with the angiotribe (Figs. 235 and 236). The uterine stump of the tube was dissected out and the horn of the uterus stitched. The uterus was then restored to its normal position, the peritoneum and bladder adjusted, the longitudinal vaginal incision stitched, the transverse incision being left open and the vagina packed with gauze. On being placed in bed she was immediately adjusted to the Fowler position (Fig. 237) and kept there for several days. This position is attained by elevating the head of the bed, thus facilitating drainage of the pelvic and abdominal cavities. The head of the bed is raised two and a half to three feet. To prevent the patient slipping down toward the foot of the bed a sheet attached at both ends to the head of the bed is passed down around the buttocks like a sling, a pillow being placed between it and the buttocks for comfort.

Case II.—Miss L., a young hairdresser, who was sent into the hospital by her physician to be curetted for leucorrhœa and menorrhagia. She had had a miscarriage a year before. Upon examination under ether it was discovered that she had a retroverted, adherent uterus and double salpingitis. As nothing had been said to her about opening the peritoneal

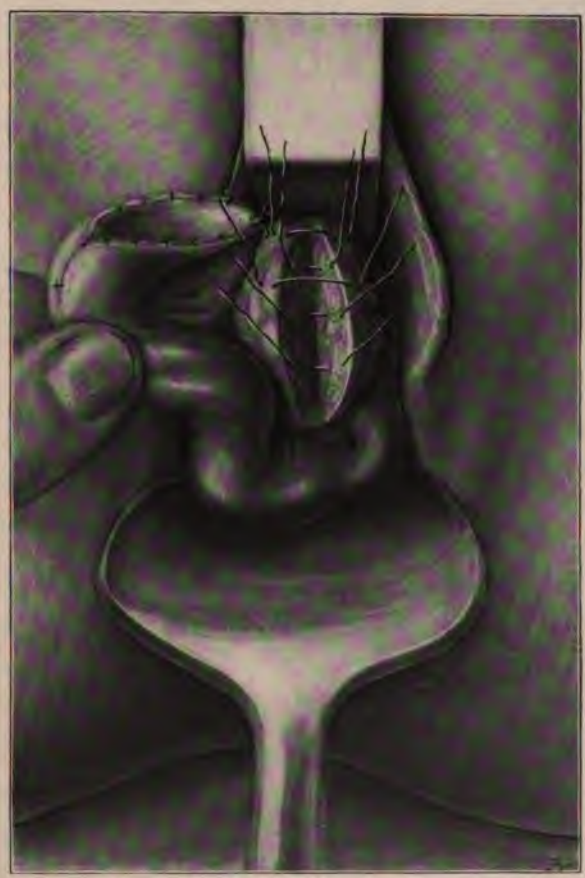
Fig. 235

Appendage of left side being removed for tubo-ovarian abscess. Angiotribe controlling blood supply in the mesosalpinx. The instrument has been applied at fimbriated end and tissue cut away. The angiotribe will now be removed and reapplied from that point to the horn of the uterus. The tube will then be dissected out at the horn of the uterus and the wound closed with sutures.

cavity, only curettage was done. Following this she developed fever and sensitiveness over both ovarian regions, and ten days later she was subjected to vaginal section. Old adhesions were firm and extensive over the posterior face of the uterus, reaching to the top of the

fundus; both tubes were occluded and adherent to the ovaries, with collections of mucopus and seropus at the infundibula of the left and right sides, respectively. The adhesions were broken up, the uterus and appendages, first of one side and then the other, delivered into the vagina. The fimbriæ of the left side were separated from their grip on the ovary, massaged, and opened out. On the right the fimbriæ were

FIG. 236



Second stage of operation. The fimbriated end of tube amputated and diseased portion of ovary removed.

obliterated hopelessly and the tube sacculated. The adhesions to the ovary were separated, the sac incised and evacuated. Both ovaries were washed with saline solution and bichloride, the tubes irrigated with the same, using sufficient pressure to dilate them throughout their entire length, and disinfected with iodine on silver probe. Gauze was packed in cul-de-sac, draining through the posterior fornix. The round liga-

ments were shortened and anterior incisions closed. Gauze was also packed in the vagina. Patient placed in bed in Fowler position. Both patients made a smooth and satisfactory convalescence. This patient has married since the operation.

Anterior colpotomy is used by different operators for accomplishing the relief of displacements in various ways. Dührssen and Wertheim shorten the round ligaments sometimes by doubling them upon themselves, as I have described, and sometimes by fastening a loop of the round ligament to the vaginal incision. The latter method is advocated by Vineberg, of New York. In certain instances the uterus is attached to the vaginal wall by the method known as vaginal fixation. The dangers of this method, I think, have been greatly exaggerated, and the unfortunate consequences that have followed in the cases reported have undoubtedly been due to an unnecessary and unwarranted extreme anteversion of the uterus. Judgment must be used in determining the point upon the anterior uterine wall at which the vagina should be attached.

I frequently put a sustaining suture through the anterior uterine wall, attaching it to the vagina, in cases in which I find undeveloped round ligaments or in which the inflammatory deposit at the base of the broad ligaments tends to hold the cervix forward in the pelvis, thus making undue tension upon the round ligaments.

SHORTENING OF THE UTEROSACRAL LIGAMENTS.

This is a comparatively new procedure for the cure of retrodisplacements of the uterus, the last and the best. Bovée has employed this procedure in a greater number of cases than any other operator, sometimes reaching the ligaments through an abdominal incision and sometimes through a posterior vaginal section. It may be used in connection with shortening of the round ligaments and in this connection accomplishes an ideal result. The uterosacral ligaments are a most important factor in retaining the uterus in its normal position. They are, indeed, the all-important factor. Whether they are shortened and made to perform their normal functional support by direct operation upon them, or whether the indirect result of some other operation enables them to involute and recover their tone and sustaining power, certain it is that unless they come to the aid of the other ligaments and hold the cervix high in the hollow of the sacrum, sooner or later the condition of the displacement will be reproduced.

The uterosacral ligaments are the most rational structures to utilize for the cure of retrodisplaced uteri, but operation upon them per vaginam is difficult to apply, except in selected cases, such as prolapsus and those in which the vagina is relaxed and the perineum torn. The ligaments under these circumstances can be readily reached through the posterior fornix, doubled upon themselves and stitched in a manner similar to the round ligament operation.

MYOMECTOMY.

The trend of gynecological work in all its departments for the past ten years has been strongly toward conservatism, seeking not only to preserve anatomical structures, but also to conserve physiological function. This has nowhere been more conspicuous than in the application of myomectomy in preference to hysterectomy in the treatment of fibroid tumors of the uterus, and the further it is extended the more numerous become the cases in which it is apparent that myomectomy can be applied and the uterus preserved. It has been demonstrated that when tumors are small they can be reached through the vagina, and the advantages of this route of attack secured in their removal. The bed of the tumor requires careful and delicate treatment to avoid hemorrhage, and in my experience the anterior vaginal incision, in selected cases, offers these advantages to a most satisfactory degree. If the tumor or tumors are in the anterior wall they are brought into view as the bladder is dissected from the uterus, and removed in succession, the bed of the tumor being closed with a buried catgut suture. If they are at the fundus they are brought into view and reach by lifting the bladder strongly on a retractor, the fundus being gradually brought down into the vagina as the tumors are removed, and the peritoneum closed over their site by Lembert suture. And so the uterus is rotated into the vagina as the work proceeds until the posterior aspect of the uterus is in view and tumors removed, even as low down in the posterior wall as the cervix.

Uterine polypi are, as a rule, removed per vias naturales. In cases in which the tumor is large and requires morcellation for its removal, the work can be greatly facilitated by performing the anterior vaginal section and splitting up the anterior uterine wall, as in vaginal Cæsarean section, as far as may be necessary to reach the seat of the growth. After removal, the uterus contracts down and can be easily restored by suture to its normal condition. It has been found that the danger of infection from the interior of the uterus, which was formerly thought to be very great in these cases, is of no serious importance except in cases of sloughing polypi. As an illustration of the innocuousness of the interior of the uterus the following case is cited: In a myomectomy recently in which a large tumor was removed from the fundus uteri by abdominal section the uterine cavity was entered and the mucous membrane found extensively degenerated. The uterus was curetted through the opening in the fundus, swabbed out well, and some gauze carried down through the cervix into the vagina, after which the uterine wall was restored by suture. There was no infection following the procedure, the patient making an afebrile convalescence. McCosh has made cultures of scrapings from the uterine cavity in a number of cases in which the uterine cavity was entered in myomectomy, but in only one instance did he get any culture, and even that was thought to be an accidental contamination.

Martin, of Germany, is strongly in favor of the vaginal route in dealing with fibroids of the uterus. He insists that the size of the tumor is not in itself a contraindication, since growths of large size can readily be removed per vaginam by morcellation. On the other hand, in the presence of firm suprapelvic adhesions, especially intestinal, the abdominal route is preferable; but deep pelvic adhesions and intraligamentary tumors are best handled from below. Martin fears injuries to the bladder and uterus more than he does hemorrhage, especially the former. He has never injured the ureters during vaginal myomectomy, though this accident has frequently occurred in his abdominal operations. When it is possible he enucleates tumors without removing the uterus. In young women he aims to leave one ovary. During three years he has performed 87 vaginal and 31 abdominal myomectomies. The latter were all complicated, and 6 terminated fatally. Of the vaginal operations, 35 were total hysterectomies, with no deaths, and 52 were enucleations, with 2 deaths.

The possibility of dealing with small tumors per vaginam changes radically the viewpoint in cases of fibroid tumor. Between the waiting policy of those who take the position that an unmarried woman suffering from a fibroid tumor, however insignificant, should not be permitted to marry, but that nothing should be done looking to its removal, unless, after months or years of waiting and watching, the tumor shows signs of growth—between this position and the attitude of those of the radical wing of the profession who insist that in all cases of fibroid tumor of the uterus nothing suffices but prompt and sweeping hysterectomy, we have now a middle ground, a golden mean, in which we can say to a woman suffering from a fibroid tumor, "Have it removed at once." This will not only relieve her present and anticipated troubles, but it will also set her mind at rest. If the tumor or tumors be small, they can be removed per vaginam with the least possible traumatism, danger, or discomfort. If the tumors are too large to permit of this procedure, they are amenable to myomectomy by the abdominal incision, radical work of hysterectomy being confined to an extremely limited number of cases, and those usually in women at or beyond the menopause.

STERILITY.

In cases of sterility, in which the husband has been eliminated as the source of the difficulty, the causal factor can be located either in the easily approached condition of anteflexion and endometritis or in some occluding pathological condition that prevents the progress of the ovum from the ovary to the uterus. In many instances the latter condition is caused by the most trivial mechanical interference, such as cobweb adhesions surrounding the ovary, or restraining the fimbriæ and binding the tubes in tortuous and constricted positions. These conditions are in many instances the result of remote infection from a chronic endometritis, and are frequently impalpable by abdominal manipulation.

While it may not seem justifiable to subject a woman to laparotomy in cases complaining simply of sterility, the simplicity of the procedure from the viewpoint of the patient makes it entirely proper in cases of sterility, after dilating the cervix and curetting the uterus, to open into the pelvis through the anterior vaginal fornix as an exploratory procedure, dealing with the appendages according to the conditions found. Of course, this work can be done through the abdominal incision, but from the standpoint of the patient the simplicity of the operation per vaginam and its freedom from danger indicate that the vaginal route is the more desirable for the treatment of these conditions.

ECTOPIC PREGNANCY.

Much criticism is always heaped upon the man who dares to propose the vaginal operation for the relief of ectopic pregnancy. And yet after considerable experience with this method in ruptured and unruptured tubal pregnancy it seems to me the most rational and direct route of attack. The difficulties of the situation, as a rule, are not to be compared with those incident to an acute or chronic tubo-ovarian abscess. In the majority of instances there are no adhesions to deal with and there is no infection or pus focus. If the tube is not ruptured, its removal per vaginam is about the simplest proposition the gynecologist is called upon to deal with. If the tube is ruptured and active hemorrhage is in progress the main channel supplying the blood, the ovarian artery, is easily reached and controlled, after which the products of conception and the blood clots are removed at leisure. In the great majority of cases active hemorrhage has ceased at the time of operation, and all that the surgeon finds necessary to do is to remove the blood clots, and that not very thoroughly, and the products of conception. This can all be done with as great thoroughness through the vagina as through the abdomen, and with as extreme consideration for the appendages of the opposite side.

The latest refinement of a conservative character in dealing with tubal pregnancy consists in shelling out the contents of the oviduct and leaving the tube *in situ*. The rent may or may not be closed. This is being done in Europe and in this country, and by both the abdominal and the vaginal methods. It would seem to need no argument to commend it to all operators. In cases of active alarming hemorrhage the ovarian artery can undoubtedly be reached with greater despatch by the abdominal incision than by the vagina. Moreover, the vaginal method necessitates the lifting of the patient to a table, whereas in desperate cases the abdominal operation can be done in bed and further loss of blood instantly prevented. But in the less urgent cases the vaginal operation is preferable.

VAGINAL CÆSAREAN SECTION.

The latest applications of the vaginal method are vaginal Cæsarean section and the reduction of inversio uteri. The majority of the Cæsarean operations that have been performed have been undertaken for cancer of the uterus, but the number performed for puerperal convulsions is increasing rapidly, and this condition will furnish the chief indication for such an operation in the future. To Dührssen, of Berlin, the credit is due for having introduced this valuable method into practice. The indications for the operation, as given by Dührssen, are: "1. Abnormal conditions of the cervix and lower segment of the uterus (carcinoma, myoma, rigidity, stenosis, partial pouch-like distention of the lower uterine portion). 2. Dangerous conditions of the mother, which may be removed or relieved by prompt emptying of the uterus; affections of the heart, lungs, and kidneys. 3. Condition of the mother where death is imminent and can be foreseen." The last two indications have value only in cases in which the cervix is closed and not dilatable, or where the depressing influence of labor pains should be obviated, as in affections of the heart and lungs. In pregnancy complicated with cancer of the uterus Dührssen advocates immediate vaginal section, with subsequent extirpation of the uterus, no matter at what time of pregnancy or at what stage of labor this condition is encountered.

The technique consists in making the anterior vaginal section, separating the bladder freely from the vagina and uterus and then incising the anterior lip of the cervix in the median line, continuing the incision up the anterior wall of the uterus as far as may be advisable. It is rarely necessary to go above the lower segment. The uterus is then emptied and the incisions closed, always providing for free gauze drainage. In some cases it will be necessary to incise the cervix posteriorly also. Under these circumstances an effort should be made after incising the vagina to strip up the peritoneum from the posterior uterine wall as far as the incision may extend so as to make the operation entirely extraperitoneal and thus avoid the danger of infecting the peritoneum. The rapidity with which this operation must be done at times may render this precaution inadvisable. The cul-de-sac should then be left open and drained.

INVERSIO UTERI.

In the vaginal operation for inversion of the uterus we have a procedure that for safety, simplicity, and efficiency surpasses all methods that have been suggested. The operation is so rational that the wonder is that it was not the very first procedure to be proposed for the relief of this condition rather than the last. The technique is as follows: The cervix is seized with traction forceps and dragged down into view, the operator electing whether he will incise the constricting band anteriorly or posteriorly. If the latter, that lip of the cervix is drawn down

allowing the fundus to rotate up behind the symphysis and an incision made with scissors or knife in the median line extending through the constriction. If the anterior incision is the one of choice, that lip is drawn down and similarly incised. The latter method offers the advantage of being more convenient both for the incision and the final suturing. Each, however, has been used with eminent satisfaction to the operators.

Dr. Reuben Peterson reports the following case: The patient was an American, aged twenty-six years, and married three years. Her family and personal histories were negative. Her menstruation first appeared at the age of twelve, and up to the time of her present trouble was entirely normal. Her first confinement occurred about fifteen months before her entrance into the hospital. It was an easy labor, and was terminated by forceps, the instruments being applied only about five minutes. The patient did not remember about the delivery of the placenta and felt nothing give way. She flowed very profusely and was given ergot, presumably. She stopped flowing soon after the completion of labor, and there was no further hemorrhage until the seventeenth day, at which time she had been up and about the room for a week. Two weeks later she consulted her physician, who told her there was something wrong with the uterus. He made a number of unsuccessful attempts "to fix it." Dr. Peterson saw the patient soon after this. Vaginal examination disclosed a typical inverted uterus, with rather a small fundus, situated about one and a half inches within the introitus. High up in the vagina could be felt the cervical lips, forming a complete collar or rim at the extremity of the uterus. The inverted uterus was grasped with the volsella and pulled forcibly outward and downward. Another volsella caught the anterior vaginal mucosa in the median line just above the anterior lip of the cup and pulled it sharply upward. Through the vaginal mucosa thus made tense a horizontal incision was made some two and a half inches in length. To avoid opening the bladder the incision was made as close to the cervix as possible. The vesicouterine peritoneum was opened and the cervix exposed. A volsella was placed on the anterior lip to either side of the median line and the cervix incised between. This incision was carried upward in the anterior median line of the uterus to within one-third inch of the fundus. The inversion was now easily reduced, the fundus going upward, and each half of the divided cervix being carried through half the arc of a circle and finally meeting, so that the two halves formed a complete cervix situated downward, not upward. He now adopted the suggestion of Taylor, and removed a wedge-shaped piece of the bulging uterine wall on either side of the incision. This was done to enable the retracted edges to come together. The uterine incision was next closed by a continuous catgut suture. The needle was passed from the peritoneal surface down to but not through the uterine mucosa. There was some gaping in one or two places, in spite of the utmost care to bring together the peritoneal edges. An unsuccessful attempt was made to close in the spaces by interrupted

sutures, but the stitches tore through the uterine wall when much tension was placed upon them. A catgut suture was passed around each round ligament close to the uterus, and each end passed through the anterior vaginal wall and tied after the fundus was returned within the pelvic cavity. This brought the defectively sutured line of incision up against the bladder peritoneum, at the same time giving support to a fundus which had been prolapsed for months.

THE PREPARATION AND AFTER-TREATMENT.

To prevent unpleasant experiences from movements of the bowels during operation no rectal injections, high or low, are allowed within twenty-four hours of the operation. For clearing the intestinal tract three compound cathartic pills (U. S. P.) are given the day preceding the operation. The instructions to the nurse are: Three compound cathartic pills about 2 P.M. (not later). If the bowels move the third time give ½ drachm tinct. opii camph., and repeat every time the bowels move thereafter. The pills will, as a rule, produce two or three thorough evacuations before bedtime. In rare instances the catharsis will be excessive unless checked, and for that reason the order is given to check them with paregoric. If no paregoric is required, trional (gr. xv) is administered at bedtime to tranquillize the nerves and produce sleep. If paregoric has been required the trional is not indicated. In no instance where these instructions have been carried out in all details (especially the hour of administration) has any leakage from the bowels given annoyance during the operation.

The vagina is sterilized by vaginal douches of bichloride solution, 1 : 3000, given twice each day for several days preceding the operation. The day before the vagina is packed to the degree of slight distention with iodoform gauze 10 per cent. immersed in and wrung out of hot solution of bichloride, 1 : 5000. This is removed by the operator immediately before beginning the operation. The vagina is then douched or swabbed with normal saline solution.

In dressing the case after operation iodoform gauze is used freely. This gauze is 10 per cent. iodoform that has been soaking for weeks in bichloride solution, 1 : 500. Upon beginning the operation as much of this as is considered necessary is put to soak in sterile hot water and there it remains until required, when it is wrung out as dry as possible and used for drainage or packing, or both, as indicated. The excess of iodoform and of the bichloride is washed out by this process and a safe gauze that is not only aseptic but antiseptic is the result. In all cases of hysterectomy the vaginal incision is left open and gauze packed into the pelvis, carrying the intestines up beyond any possibility of contact with the broad ligament stumps. If extensive adhesions between the intestines and the uterus and appendages have been severed or the pelvis has been stripped of peritoneum, the gauze is placed in contact with the denuded surfaces and the pelvis

packed full of gauze, carrying the intestines up out of the pelvis. The gauze is packed in one long strip. The presence of this gauze stimulates a profuse outpour of serum, which washes down any debris or sepsis on to the gauze, by which it is disinfected and drained away.

There is no more perfect drain for the pelvis or peritoneal cavity. This gauze is left undisturbed, if all goes well, until the fourth day, when a beginning of its withdrawal is made. From four to six inches of gauze is drawn out each day, the protruding amount being cut off at the vulva and the proximal end returned to the vagina. In the mean time vaginal douches of boracic acid, saturated solution, are given

Fig. 237 Fig. 238

The Fowler position for abdominal and pelvic drainage.

twice each day. This solution is carried up by the capillary attraction of the gauze, dissolves any adhesions that may have formed, and sets the gauze free. The last of the gauze comes away usually on the seventh or eighth day. The gauze being in one continuous strip, there is no danger of any stray piece being left, and this entire after-treatment is done by the nurse without removing the patient from her bed. As the gauze is being thus gradually drawn out the intestines, the head of the vagina, and the surrounding parts gradually settle down to their normal positions, and when the last of it comes away the head of the vagina collapses and entrance to the pelvic cavity is sealed. The presence of

this gauze in the pelvis drains away all infection and renders the surfaces aseptic. The plastic exudate that may be thrown out, unless infected, is reabsorbed and no permanent adhesions remain.

In all cases requiring the most complete drainage obtainable the patients on being put to bed are at once placed in the Fowler position, as shown in the diagram. This favors drainage by gravity and is a life-saving device in cases of acute infection. The two patients shown in (Figs. 237 and 238) are those whose histories have been recited in this article—cases of acute pelvic infection.

On general principles most operators are ready to subscribe to the dictum that, as far as the patient is concerned, any operation that can be as well done through the vagina as through the abdominal incision is better done along the vaginal route. The possibilities of this will undoubtedly vary with individual experience, but the greater the experience the broader becomes the field of application, until it seems that any pathological condition that is confined to the true pelvis can be dealt with as satisfactorily, with as permanent results and with far greater safety to the patient, through the vaginal incision than through the abdominal incision. The method lends itself to every form of conservative work upon the uterus and its appendages that has been suggested in the trend of recent modern gynecology. The successful application of it requires patience, experience, and skill, but when once the profession has been convinced of its superiority, I believe it will steadily and rapidly grow in favor and become the accepted method for the man who practises the specialty of gynecology.

VAGINAL HYSTERECTOMY.

Strange as it may seem, this radical operation of removing the uterus was the first of the vaginal operations which necessitated an incision into the peritoneal cavity. It was the pioneer procedure and opened the way for all the succeeding vaginal operations. The salient features of the operation are: First, the control of the blood supply; second, avoidance of injury to the ureters by ligature or knife, and third, avoidance of injury to the bladder, rectum, or intestines. For its successful performance a thorough knowledge of the anatomical relations of the various structures in the pelvis is essential. This knowledge is made of practical value by keeping constantly before the mind a mental picture of the pelvic organs in their normal positions, to be modified from time to time during the operation as their relations are found to be distorted by pathologic processes and growths.

The uterine arteries arise from the anterior branches of the internal iliacs, run forward and inward at the lower border of the broad ligaments toward the cervix uteri. At its lowest point in the pelvis, near the point at which it crosses the ureter, the uterine artery is on a level with the external os uteri, and at a distance of about one-half an inch from the cervix. It then passes obliquely upward and reaches the uterus near the

level of the internal os. Its course is then along the side of the uterus, anastomosing with the ovarian artery. Between the point where it crosses the ureter and the cervix it gives off a branch to the vagina, and above opposite the internal os uteri a second branch called the circular artery, which anastomoses with its fellow of the opposite side. The ovarian artery, which is the analogue of the spermatic in the male, arises from the abdominal aorta. This origin is to be borne in mind, for coming as it does from the largest arterial trunk in the body, its blood pressure is very great. It therefore necessitates firm compression by ligature or clamp to prevent hemorrhage. It enters the broad ligaments at its pelvic end and runs in a tortuous course near the upper border of the ligament toward the horn of the uterus, where it is deflected downward and anastomoses along the side of the uterus with the uterine artery. In its course the ovarian artery gives off numerous branches to the Fallopian tube and the ovary, which reach these organs through the mesosalpinx and meso-ovarium, respectively. A branch is also given off to the fundus uteri near the horn. The vagina receives its blood supply from the arteries which arise from the anterior division of the internal iliac, the uterine and middle hemorrhoidal arteries. This abundant blood supply to the vagina is often the source of a slight but persistent and annoying hemorrhage.

The ureters cross the iliac arteries at their bifurcation, descend into the pelvis, and pass obliquely forward in the cellular tissue beneath the peritoneum, cross the broad ligaments below the uterine arteries at a distance of one-half to one inch at either side of the cervix and enter the base of the bladder. Practically the distance between the cervix and the ureter, at the point where it crosses the uterine artery, is a little less than a thumb's breadth. In passing the ligature, therefore, a good practical guide is obtained by grasping close to the cervix, between the thumb and the finger, the tissue between the cervix and the ureter and passing the ligature directly over the end of the thumb.

Technique.—The importance of asepsis in all its minutest details, in every gynecological operation cannot be kept too prominently before the mind, and especially in vaginal operations which enter the peritoneal cavity asepsis should be vigorously applied. The condition of the bowels is of great importance. Unless the rectum and colon are thoroughly evacuated there is always the liability of some fecal matter being expelled from the rectum and soiling the hands, towels, and field of operation. To avoid this it is the rule of some operators to have the intestinal tract cleared not only by cathartics, but also to wash out the rectum and colon with high saline injections. In my experience these high salines if given as late as six hours previous to the operation are apt to be partially retained and come down during the operation to delay the work and complicate the situation. Unless a patient is known to be seriously constipated, or to have symptoms pointing to fecal obstruction, in which case several days may be required to thoroughly evacuate the bowels, a satisfactory routine custom is to give three compound cathartic pills about 2 P.M. on the day preceding the oper-

ation. This, as a rule, produces two and sometimes three satisfactory evacuations before bedtime. One cathartic pill will gripe but will produce no result, two pills will gripe less and produce only moderate results, while three pills will sweep through the intestines promptly and efficiently without marked discomfort. If, as rarely happens after two or three movements, the effect seems exhausting to the patient, thirty minims of camphorated tincture of opium is prescribed to be repeated at every succeeding movement of the bowels. As a rule, the administration of the opium is not necessary. Under these circumstances fifteen grains of trional are given at bedtime to quiet the nerves and assure a good night's rest. The immediate field of operation should be subjected to the routine preparatory treatment, as described on page 484.

With the patient in the lithotomy position and the posterior retractor in place the cervix is grasped with a strong traction forceps and dragged down as near to the vulva as the conditions will permit without too great force. The order in which the vaginal incisions are made varies with different operators. There is an advantage, however, in making the anterior incision first, for the reason that the tissue through which one must pass here to enter the peritoneal cavity are less apt to be the seat of disease and infection than those met with through the posterior incision.

It is a good rule to do the clean part of the work first. A curved incision is made around the cervix anteriorly at the vaginal junction (Fig. 239). This is extended through the mucous membrane and connective tissue. The position of this incision is indicated by the natural fold of the vagina at the cervical junction. This fold or crease is made apparent by moving the cervix, which is in the grasp of the traction forceps, up and down in the vagina.

The handle of the scalpel or some blunt instrument is used to dissect the bladder from the anterior wall of the uterus. This usually can be accomplished by a dull dissection with the handle of the scalpel and the finger (Fig. 240). Pressure must be constantly made against the uterine tissue to keep in the line of cleavage and avoid injury to the bladder. The danger of penetrating the bladder arises from the resistance offered to this procedure by the uterovesical ligament—a strong band of fibrous tissue directly in the median line. Until the operator has gotten beyond the attachment of this ligament to the uterus there is danger of the finger or scalpel handle riding forward on this ligament and suddenly piercing the bladder wall. This accident is best avoided by beginning the dissection well out at either side of the cervix and working toward the median line, first on one side and then on the other, until the handle of the scalpel can be passed through behind the uterovesical ligament from side to side. The ligament is then cut away from the uterus at its attachment by a lateral sweep of the knife. The rest of the dissection of the bladder from the uterus can be accomplished by the finger. To avoid the possibility of the finger entering the bladder firm pressure should be made against the uterus with the ball of the

PLATE XXXIX.

Vaginal Hysterectomy. Further Dissection than Fig. 239.

finger, and the finger not allowed to advance unless the bladder tissue can be felt rolling in a double fold in front of the finger and stripping off from the underlying tissue. If there has been no inflammatory process between the uterus and the bladder and no invasion of this tissue by cancerous or fibroid disease, the line of cleavage is very easy to follow and the bladder peels off under slight pressure. If, however, any of these pathological conditions are present bands of fibrous or

FIG. 239

Vaginal hysterectomy. Cervix drawn down and circular incision made around it.

connective tissue will be met, which will obscure the line of cleavage and necessitate the use of the sharp edge of the scalpel from time to time. Having reached the folds of peritoneum between the fundus of the bladder and the uterus, it will be found somewhat baggy. By keeping the finger firmly in contact with the uterus it may be forced through into the peritoneal cavity. In some cases the peritoneum will yield in front of the finger, being stripped from the fundus of the uterus and some difficulty be experienced in penetrating into the cavity.

Under these circumstances an artery clamp kept firmly in contact with the uterus may be forced through, and then opened wide while being withdrawn, thus tearing the hole large enough to admit the finger. Or the bagging peritoneum may be caught in a long artery clamp, pulled down into view and snipped with the point of the scissors between the

FIG. 240

Vaginal hysterectomy. Pushing up and dissecting bladder from uterus with the finger.

clamp and the uterus. After an opening has been made both index fingers are inserted with the ball of the finger toward the uterus, and then rotated so the dorsal surfaces come together, at the same time separating them. This will tear the peritoneum along the line of its attachment to the uterus and obviate the possibility of any rent run-

ning forward into the bladder. The opening thus made can be enlarged to any extent by separating the fingers laterally and extending the tear well out on to the face of the broad ligaments.

Usually the hemorrhage attending this part of the procedure is inconsiderable and requires no attention. If, as sometimes happens, any arteries are met with they should be ligated with fine catgut. The general oozing can be controlled by saturating a small piece of gauze

FIG. 241

Vaginal hysterectomy. Cervix drawn forward. Douglas' cul-de-sac opened and then enlarged by insertion of index fingers, which are then forcibly separated in a lateral direction.

with a solution of adrenalin chloride (diluted), and inserting it between the bladder and the uterus, where it may be left for a few moments, or during the next step of the operation.

The Posterior Incision.—The cervix, still in the grasp of the traction forceps, is lifted up toward the symphysis and the posterior vaginal fornix exposed. The incision is made across the vagina through the mucous membrane from left to right. This may be done with one sweep

of the knife or in two incisions, either beginning at the middle point and cutting out or beginning at the side of the cervix and cutting toward the median line. The rigidity or the relaxed condition of the vagina will indicate which is to be preferred. The danger of the posterior incision lies in the proximity of the rectum and the possibility of wounding it. In normal conditions there is a space between the rectum and the vaginal attachment to the cervix from one-quarter to one-half an inch. This is the bottom of Douglas' pouch. But in pathological conditions this may be abbreviated and distorted to any extent. The safety of the incision, as in the anterior section, lies in adhering closely to the uterus. The mucous membrane only is incised. It is then stripped down from the underlying tissue till the pouting peritoneum of Douglas' cul-de-sac is felt upon the finger. The same technique in entering the peritoneal cavity is now employed that was used in the anterior incision. The guiding principle is to stick to the uterus. In some cases the finger can be forced through and in others it is necessary to use an artery clamp or a pair of blunt scissors to puncture the peritoneum, always keeping in mind that the cervix is the guide, and must be hugged closely if you wish to be safe. If a curved, pointed scissors is used, keep the concave side toward the cervix. After an opening has been made through the peritoneum it can be enlarged by tearing the tissue with the fingers or stretching and tearing with steel dilators at will. As soon as the vaginal incisions are made the pelvis is explored carefully and thoroughly with the finger to locate accurately the seat of disease, the points of adhesion, and the difficulties that must be met. If adhesions are found, as is almost invariably the case, they must be broken up and the diseased organs to be removed, separated from their abnormal attachments. In separating adhesions the rule is to make pressure against the firmer of the two structures to be separated. For example, if a coil of intestine is to be separated from the uterus pressure should be made against the uterus and the more delicate structures of the intestine avoided as much as possible. If the ovary and tube are adherent to the walls of the pelvis, pressure should be directed against the walls of the pelvis and the appendages thereby saved from as much laceration and injury as possible. Even if they are to be removed the line of cleavage should be followed, hugging closely the firmer of the two structures to be separated.

Work carefully and keep the contour of the organs intact, so that the line of cleavage may be followed. It is impossible to tell how far the adhesions may extend, and it is only by preserving the contour that the structures can be followed and distinguished from each other by the sense of touch. The presence of pus in the ovary or tube is a most important reason for avoiding injury to the organs, lest the pus be set free and the field of operation contaminated. It is when structures so much alike in consistency and contour as a Fallopian tube and a coil of intestine are to be separated that the most delicate tactile sense must be exercised. Under these circumstances it is frequently necessary to pass the finger back to the origin of the tube or to that part of it at which

there was no doubt of its identification, and follow it out again and again to the seat of immediate procedure. This is the most delicate work of this character that one is called upon to do and calls for the supremest exercise of the pictorial, scientific, or gynecological imagination previously spoken of, as the tactus eruditus. It may be desirable to separate the adhesions widely at this stage of the procedure, provided they yield readily and are easily reached. Otherwise it is better to proceed with the ligation of the lower border of the broad ligaments, thus setting the uterus free and giving more room for reaching the appendages. The anterior and posterior vaginal incision are connected at either side of the cervix and the tissue stripped off from the cervix by dull dissection with the finger or thumb till the uterine artery is reached. The location of the artery is determined by its pulsations. These are felt by compressing the tissue between the thumb and index finger from time to time as the dissection proceeds. It can always be detected and should be located. Sometimes firm traction upon the cervix is sufficient to stop the pulsations, traction should therefore be relaxed when locating the artery. The important structure to be avoided at this stage of the procedure is the ureter which passes obliquely forward and inward just below the uterine artery. There are three methods of controlling the blood supply, the ligature, the hysterectomy forceps, and the angiotribe. The ligature may be silk catgut or kangaroo tendon. The almost universal custom at the present time is to use absorbable ligatures, either catgut or kangaroo tendon. The most popular ligature is chromicized catgut, No. 3. It is threaded into a Dechamp's needle and carried through the tissue above the artery and close to the cervix. Sufficient tissue must be left, however, between the point of ligation and the cervix to prevent the ligature from slipping off after the cervix has been cut away. In cases of cancer of the cervix, in which it is always important to remove as much tissue as possible, the ureters are always in danger of being caught in the ligature. In rare instances the ureters can be located by palpation. The ureters can be positively located by catheterizing them with flexible catheters or bougies, which are left in place during the operation. Except in the hands of an expert, catheterization of the ureters is a difficult procedure, prolongs the operation, and adds one more element of danger from sepsis through the urine. Grasping the tissue through which the uterine artery passes, between the thumb and the index finger, the Dechamps needle, threaded with the ligature, is carried around the artery one-half the thumb's width from the cervix (Fig. 242). The ligature should be sufficiently long (about eighteen inches) to tie well, and in tightening the knot should be forced home with firm and steady pressure, the pressure being applied close to the knot. A second knot is then applied and the ends of the ligature left long. The tissue is now cut away between the cervix and the ligature. If the uterus is movable and the tissue above can be easily reached, a second ligature is threaded into the Dechamps needle and the broad ligament transfixed at a point as near as possible to the ovarian artery. It is then tied. The incision between the ligature and the cervix is now

extended up to the point at which the broad ligament has been transfixed. The scissors are used for extending these incisions. Attention is now directed to the opposite side of the pelvis and similar procedures to

FIG. 242

Vaginal hysterectomy. First ligature being passed around the uterine artery close to the cervix.

these just described are employed. These early steps in the operation may be taken first on whichever side seems most convenient to the operator, but, from this point on, the work will be greatly facilitated by

following that side of the pelvis on which there is the less disease. The effort is now made to invert the uterus, turning the fundus down into the vagina. If the uterus is free from adhesions this is readily accomplished by passing the fingers over the fundus through the anterior incision and dragging it down, the cervix in the mean time being carried back into the hollow of the sacrum. The traction forceps is now removed from the cervix and used to grasp the fundus. Firm traction is

FIG. 243

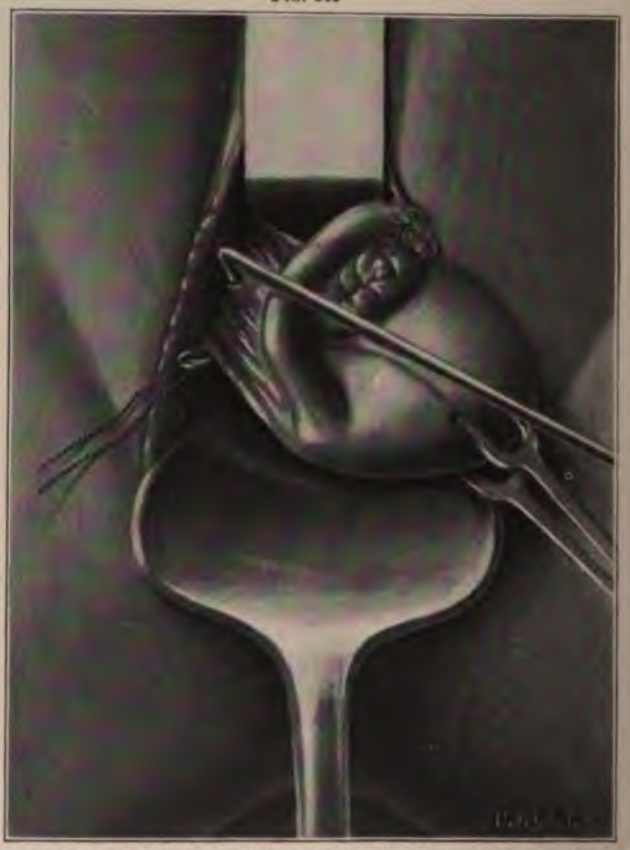
Vaginal hysterectomy. The body of the uterus and the right appendage delivered into the vagina and the ligature being placed upon the remainder of the broad ligament.

applied and the ovary and tube are freed from their adhesions and brought down with the fundus (Fig. 243).

A ligature threaded into the Dechamps needle is now passed over the free border of the broad ligament between the uterine appendages and the pelvis. It is tied and the tissues thus surrounded are cut away between the ligature and the ovary. This sets the uterus free upon one side and by a little manipulation it can be delivered outside the vulva.

Any adhesions about the remaining appendage that may interfere with this procedure must be separated with the fingers and the appendage brought down with the uterus. Only the upper border of the broad ligament—*i. e.*, the infundibulopelvic ligament—now holds the uterus. This must be ligated as upon the other side and cut away (Figs. 244 and 245).

FIG. 244



Vaginal hysterectomy. The ligated pedicle containing the uterine artery as well as the ligature being placed on the infundibulopelvic ligament shown.

The manœuvre of turning the fundus down into the vagina so the ligatures may be applied from the free border of the broad ligament down, is greatly facilitated by making the longitudinal incision of the vagina as described in anterior vaginal section. The fundus is then turned down through the anterior incision instead of the posterior. This enlarged opening affords additional facility also for breaking up adhesions about diseased appendages and delivering them later into the vagina. The author has found this so serviceable that its use is becoming a routine custom in all hysterectomies. By this method the

uterus is removed intact with its appendages attached. The uterine cavity has not been entered to set free any infection lurking there and the completeness of the specimen makes it easy to satisfy one's self that no portion of the diseased organs has been left. If, however, the amount

FIG. 245

Vaginal hysterectomy. Representing ligation of the broad ligament in two sections and cutting between the ligature and the uterus, thus liberating the organ on that side.

of disease in the appendages is extensive, the tubo-ovarian mass on either or both sides large and bound down by adhesions, the work is greatly facilitated by bisecting the uterus anteroposteriorly and so cleaning out either half of the pelvis separately (Fig. 246). This is done as

follows: as soon as the uterine arteries are controlled the traction forceps holding the cervix is removed and made fast to the cervix at one side of the external os. A second forceps is attached to the cervix at a corresponding point on the other side and firm traction made on both. A pad or strip of gauze is now passed into Douglas' pouch and carried well up, if possible above the fundus, to lift the omentum and the intestine out of danger. With a strong pair of scissors or a knife the uterus is then bisected from the external os to the middle of the fundus. As the fundus is approached the strokes of the scissors or knife should be short and gentle to avoid injury to any vital tissue that may have slipped down against it. Pryor's curved director may be slipped over the

FIG. 246

Vaginal hysterectomy. Vertical anteroposterior bisection of the uterus before securing the blood supply. (After Dudley.)

fundus and the incision thus directed. This procedure is quite free from hemorrhage; the ligatures already applied control the blood supply from the uterine arteries. Hemorrhage from the ovarian arteries is inconsiderable and is readily controlled by traction upon the forceps grasping the cervix. The fingers or the hand of the operator is now slipped in between the two halves of the uterus and the appendages, first on one side and then on the other, are freed from adhesions and turned out of the introitus into view so that the ligatures can be readily applied and the tissue cut away.

Bisection of the uterus is a most excellent device and frequently will be found of great service. Some authorities recommend it in case of cancer of the uterus. The dictates of every law of asepsis would seem to

contraindicate it when cancer is present. The prompt recurrence of cancer in this field of operation is undoubtedly due to infection of the wound with cancer germs. Instead of opening the cervix and uterus, as is done in bisection, and constantly smearing the hand with the cancerous material, it would seem the part of wisdom to obviate this objectionable feature by keeping the uterus and its disease as completely intact and separate from the wound as possible. When the cancer is situated exclusively in the cervix a successful device is to make the primary incision around the cervix down on the vagina an inch or an inch and a half below the external os. This area of vaginal wall forms a hood or cuff when brought together over the cervix, and in the grasp of a strong traction forceps shuts up the cancerous tissue and uterine secretions so they cannot come in contact with the wound.

FIG. 247

Uterus and appendages ablated *en masse* per vaginam.

The bisection of the uterus is obviously reserved for cases of double pyosalpinx and multiple fibroids. The cancerous uterus should be ablated *en masse* without bisection or morcellation (Fig. 247). In using hysterectomy clamps the steps of the procedure are the same except that the clamps are used in place of ligatures. Pryor's hysterectomy clamps are the best. It is customary to apply three upon each broad ligament. The base of the broad ligament, containing the uterine artery, is clamped at either side and the tissue cut away from the cervix. The fundus is now inverted and the appendages first of one side and then of the other brought down, and a clamp applied from the free border of the broad ligament down to and including the ovarian artery. The broad ligament is then cut down to the tip of the clamp, the third clamp is now applied to the remaining tissue of the broad ligament at either side and the tissue cut away. This sets the uterus free with its appendages, and the mass is withdrawn. In using the angiotribe the same

steps in the procedure are followed as in using the hysterectomy clamps, except that the instrument is left in place for two minutes and then removed, while the hysterectomy clamps must be left in place for forty-eight hours (Figs. 248 and 249). After the uterus has been withdrawn the severed edges of the broad ligament are grasped with hæmostatic forceps

FIG. 248

Vaginal hysterectomy. Angiotribe, instead of ligature, applied to lower part of the broad ligament close to the uterus.

and drawn firmly down, while the pelvis, the space between the broad ligaments, and the vagina are packed with gauze. A vulvar pad and a "T" bandage complete the dressing. The gauze is left in place two, three, or four days and then gradually removed day by day, the last of it coming away usually from the seventh to the tenth day.

In cases in which the ligature or the angiotribe is used little or no

pain follows the operation. The use of the hysterectomy clamps is attended with severe, sometimes agonizing, pain. All patients subjected to hysterectomy should be allowed at least one-fourth of a grain

FIG. 249

Vaginal hysterectomy. Angiotribe applied to the top of the broad ligament, the uterus having been delivered into the vagina.

of morphine hypodermically as soon as they recover from the anæsthetic. This may be repeated, as may be necessary, to control the pain. More or less shock attends every hysterectomy, which, as well as the pain, the morphine serves to relieve.

CHAPTER XIX.

TECHNIQUE OF ABDOMINAL OPERATION.

By X. O. WERDER, M.D.

Preparation of Patient.—Having decided upon an operation, it is well to encourage the patient and to avoid all excitement, as mental calm is favorable for both anæsthesia and the operation itself. All cases requiring abdominal section should be sent to the hospital unless time and distance would endanger the safety of the patient. If at all possible the patient should spend two nights in the hospital previous to the operation. The excitement of leaving home and changed surroundings of the hospital usually cause a sleepless night. The second night the patient becomes accustomed to the change, is tired out physically and mentally, and is in a better condition for a good, refreshing sleep, from which she awakens ready for the ordeal. Our rule is to give one-half grain of calomel every two hours for four doses for the first night in the hospital, and the following morning a saline laxative, such as rochelle salts, epsom salt, Seidlitz powder, or effervescent citrate of magnesia. This produces free watery purgation, leaving the patient thirsty, which is often annoying, but can be relieved by drinking large quantities of water, or, better, by repeated enemata of normal salt solution. Enemata so administered also increase kidney excretion and relieve to a very marked degree the postoperative thirst which is often extremely distressing.

The diet for the twenty-four hours before operation usually consists of gruel, toast, and coffee for breakfast, soup or cornstarch for dinner, and milk-toast for supper; a glass of milk may be given about 10 A.M. and 3 P.M. The following morning about two hours before the operation some clear beef-tea or coffee may be given, or sometimes half an ounce of whiskey well diluted.

As in all operations, the urine is carefully examined and recorded. A general physical examination is made, and any abnormality of heart or lung action is particularly noted before anæsthesia. The existence of any condition, such as nephritis, tuberculosis, syphilis, anæmia, an organic heart lesion, while not always necessarily contraindications for abdominal section, should be considered in each individual case. If anæmic or otherwise debilitated, the patient should be in the hospital several days prior to operation, and if necessary should remain in bed while being treated.

A general cleansing bath, followed by an alcohol rub is given the patient on admission to the hospital. On the day preceding the operation a second bath is given and then the special preparation of the

abdomen is done by the nurse. This preparation must be performed in a perfectly aseptic manner. When convenient a special room for that purpose should be arranged. The hands of the nurse should be scrubbed in the same manner as for operation. The abdomen and pubes are thoroughly scrubbed with soap and water and carefully shaved. The abdomen is bathed and rubbed with ether, then similarly with alcohol and bichloride of mercury solution, during the entire process especial attention being paid to the umbilicus. A moist dressing of 1:2000 bichloride of mercury is then applied to the abdomen, which is left undisturbed until the patient is placed on the operating table. The dressings are then removed and the abdomen again thoroughly rubbed and washed in the same manner but substituting gauze pad for brush. This final preparation is to be performed only by a nurse or assistant whose hands are prepared as for operation.

If there should be any evidence of a dermatitis or eczema, such as are frequently found between the folds of skin in very fat persons, or when the skin has been injured by counterirritants, these places should receive careful attention until the skin is perfectly healed in order to guard against infection from such surfaces. As the skin is the normal habitat of the streptococcus epidermidis albus, at times a very virulent organism, it is absolutely essential to have sound skin about the field of operation. When a large incision may be required the cleansing should extend from the pubes to the ensiform cartilage; in all cases it should extend considerably beyond the expected field of operation.

The description of the preparation and sterilization of instruments, gowns, towels, and dressings has been given in another chapter. The question as to the use of impermeable gloves has practically been decided, most abdominal surgeons having adopted their use entirely. When first used the tactile sense seems to be interfered with, but after a few months the operator becomes accustomed to their use. Gloves are sterilized by boiling for fifteen to twenty minutes in plain water. They should be wrapped in a towel and immediately before operation should be taken from the boiling water and emptied into a basin of sterile water or antiseptic solution. To facilitate the putting on of gloves sterile water or sterile glycerin should be poured in, care being taken not to manipulate the gloves except at the wrists with the bare hand.

Arrangement of Operating Room.—Good light being an essential feature in abdominal surgery, the operating table should be so arranged that when the patient is in the Trendelenburg position direct light can be thrown into the pelvis. Only two assistants in addition to the anæsthetizer are required for abdominal surgery, as it is best to concentrate the responsibility. Two or three nurses are constantly in the operating-room, but they take no actual part in the operation. The arrangement of tables, basins, pads, etc., should be as simple and convenient as possible, as much confusion may be avoided. The operator stands to the right of the patient, the first assistant to the left, and the second assistant at the patient's right knee. A small oblong or square enamel table covered with a sterile sheet is placed between the operator and

second assistant. On this table are the instrument trays and a basin of towels. A similar table large enough to hold four basins is placed to the right and back of the first assistant and within reaching distance. On this table are placed four basins—two for pads, one for towels, and

FIG. 250

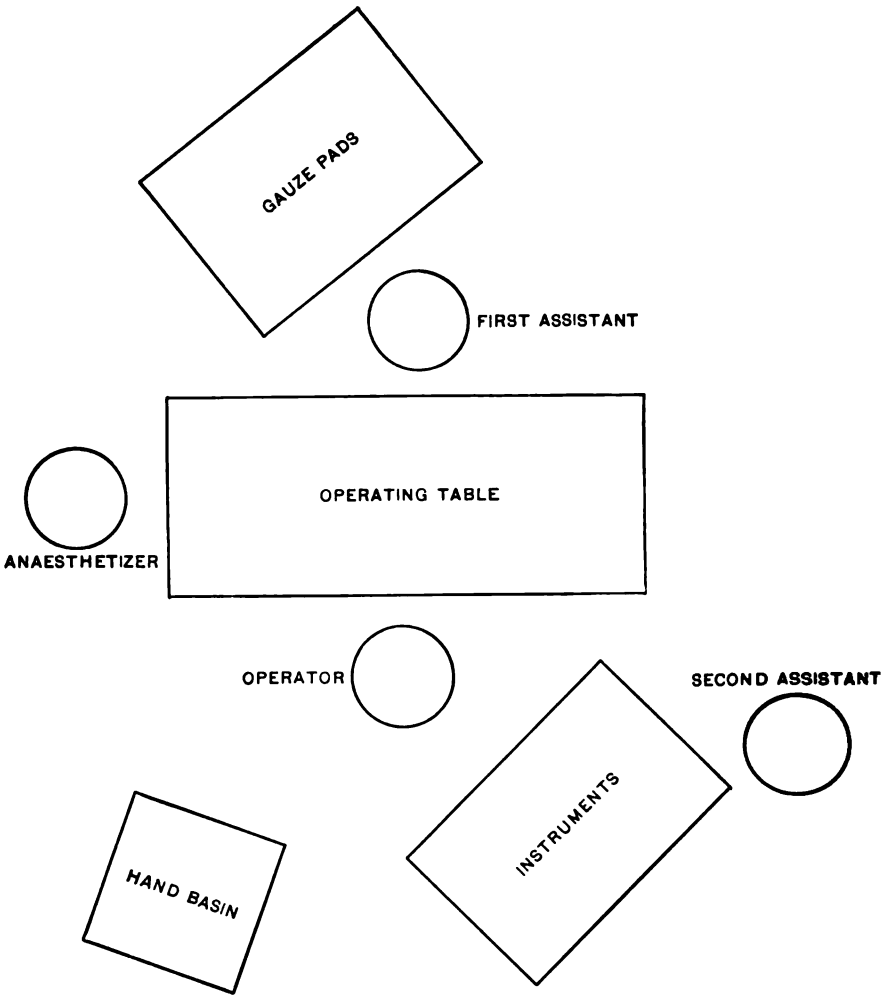


Diagram showing arrangement of assistants and tables.

one containing sterile water. A basin of sterile water for cleansing the hand is conveniently near to the left of the operator (Fig. 250).

The patient being fully anaesthetized and in proper position no time should be lost. The nurse removes the binder and dressings, the second assistant cleanses the abdomen as before outlined, meanwhile the operator and first assistant put on sterile gowns, rubber gloves, and

sterile gauntlets if the gown sleeves are short. After the abdomen has been thoroughly prepared the patient's chest and legs are covered with a blanket and rubber sheet. The field of operation is surrounded by sterile dry towels on all sides, covering not only the abdomen, but also the legs down to the knees at least, as well as the chest. Some operators prefer a sheet for this purpose, through which a slit is made exposing the median line.

The second assistant, after cleansing the hands once more, puts on gown, gloves, and gauntlets and then arranges the instruments and

FIG. 251

Diagram showing the splitting of the rectus muscle and exposure of the subperitoneal tissue.

prepares the suture material. The first assistant carefully counts all the pads once more to avoid any possible mistake.

The incision is generally median, rarely transverse. The operator places two or three fingers of the left hand along the intended line of incision, thus stretching the skin. Beginning about one and a half inches above the pubic cartilage, a small incision about two and a half inches is made through the skin and superficial tissue down to the aponeurosis with one stroke of the knife, drawing it from above downward. The sheath of the rectus muscles is then carefully divided. Then with the handle of the scalpel the fibres of the rectus muscle are separated down to the thin layer of the transversalis fascia (Fig. 251).

This tissue is picked up and cut longitudinally between two long pointed Kelly hæmostats, one held in the left hand of the operator, the other by the assistant. Under the fascia the subperitoneal tissue and finally the peritoneum proper are carefully divided, great care being observed not to injure the omentum or a loop of intestine which is frequently drawn up with the peritoneum, but which immediately drops back into the cavity as soon as that structure is nicked and air is allowed to enter the peritoneal cavity. As the different structures are cut and before the peritoneum is incised all bleeding points should be caught up with hæmostatic forceps or compressed. Ligation is rarely necessary in the median incision as compression with forceps or gauze for a very short time will generally control the bleeding permanently.

If adhesions exist between the parietal peritoneum and tumor, or if adhesions with abdominal viscera prevent a ready entrance into the cavity, the incision should be extended higher until a point is reached where the peritoneum is free, from which point the incision can be increased and the adhesions separated along the line where it is intended to open the abdomen.

The incision should not be funnel-shaped, but should be as long on the peritoneal aspect as at the skin surface. Neither the skin nor the other layers should be bruised nor should forceps include the epidermis, as such traumatisms might endanger primary union of the incision. Whenever possible muscular fibres should not be cut, but should be separated bluntly by means of the handle of a knife.

The size of the incision depends on the nature of the operation. In rare cases, if the tumor is large, the incision may extend to the ensiform cartilage; in all cases it should be large enough to deliver the tumor without bruising the edges of the wound. Large cystic tumors, especially when not adherent and when the contents are liquid, can often be delivered through a two- or three-inch incision by drawing off the fluid through a trocar, and when sufficiently collapsed grasping the sac with forceps and gradually drawing it through the incision. In this manner non-adherent cystic tumors containing fifty to seventy pounds of fluid can be delivered through a very small incision. If adhesions are present it is wiser to enlarge the incision sufficiently to be able to see the adhesions and do the necessary manipulations in full view. After all the size of the incision is of little importance when compared with the advantages a large incision affords if firm and extensive adhesions are to be dealt with. If the tumor is large, extending well up into the abdomen, it is not necessary to extend the incision down to the symphysis. When dealing with fibroids it is well to begin the incision nearer the umbilicus than the pubes, as the bladder is often drawn up into the abdomen and may be injured unless this precaution is observed. After the abdomen is opened the incision can be enlarged as far as necessary under the guidance of the finger introduced into the peritoneal cavity.

When the incision must extend beyond the umbilicus it should be carried around the latter, a little to the left and not through it. In such cases it is better to excise the umbilicus, for in doing so not only is the

scar more symmetrical but firmer, because thereby the two recti muscles with their lamellæ of fascia are freely exposed, and can, therefore, be brought more carefully together than when the umbilicus with its surrounding tissues is left.

Contrary to the general practice, the author thinks that instead of selecting the linea alba for the incision, it should be avoided and the opening made through the rectus muscle itself, for the reason that the linea is poorly supplied with bloodvessels, as compared with the muscle, and, therefore, better and speedier union can be expected when the muscle is dealt with. In the presence of large tumors the recti muscles are generally separated, the incision in such cases being made between them.

A transverse suprasymphyseal incision has been proposed by Küstner for the correction of uterine displacements on account of its better cosmetic effect, the incision being made just above the symphysis through the region of the pubic hair, or in very fat women just above it. The scar is subsequently entirely concealed by the pubic hair. The incision is made transversely through the skin and subcutaneous tissue down to the aponeurosis, which is divided longitudinally, as well as the muscles and peritoneum. The skin incision is therefore at right angles to the deeper incision through fascia, muscles, and peritoneum.

Pfannenstiel has modified Küstner's method by not only cutting through skin and fat transversely in the pubic hair region, but also the aponeurosis, separating, however, the recti muscles longitudinally—*i. e.*, parallel to their muscular fibres as well as the peritoneum. He claims for it in addition to the cosmetic effect that it is less liable to hernia because the strain on the wound is naturally in a lateral direction and this is opposed and counteracted by the skin and especially the aponeurosis which are not weakened as by the median incision. The only objection known to this method seems to be a slightly greater tendency to infection from the hair follicles. G. H. Noble recommends the same lines of incision for his intramural intraperitoneal anchorage of the round ligaments for posterior displacements.

Whatever advantage the transverse incision above described may have in certain intrapelvic operations, especially uterine displacements, it is very unlikely that it will ever supplant the median incisions to any extent, for the reason that the latter give more room for our manipulations and a better view over the field of operation.

In order to keep the intestines away from the field of operation in the pelvis the law of gravity is utilized by placing the patient in the Trendelenburg position. Almost every modern operating table is provided with an arrangement by which the pelvis can be raised to a higher level than the shoulders on an inclined plane causing the intestines to recede from the pelvis and drop into the peritoneal cavity toward the diaphragm. Before this can be accomplished the patient must be completely relaxed in narcosis. The elevated position in addition to allowing the intestines to drop into the abdominal cavity exposes the pelvic contents to better view and brings them nearer to the surface. An angle of twenty-five to

thirty degrees usually suffices, excepting when deep pelvic manipulation is necessary, or when there is an unusually thick abdominal wall, and in such cases an elevation of forty-five degrees may be necessary.

Pads.—In order to avoid unnecessary manipulation and injury to the intestines they are packed away from the pelvis toward the diaphragm with gauze pads. This is of great importance in pus cases or whenever there is putrescible fluid to be dealt with, and great care must be exercised to have the bowels thoroughly protected from contamination. To facilitate the introduction of pads, the abdominal wound is held apart by retractors and the pad is held in a long dressing forceps, which enables the operator to introduce it to any part of the peritoneal cavity that he wishes to protect.

The pads used in the abdominal section consists of four layers of gauze so made that no free threads are exposed. The edges are turned in and sewed, the pad when completed measuring three by eight inches. These are carefully counted and placed in packages of six each, and six such packages are wrapped in a towel so that the final count must be a multiple of six. In addition to the small pads one large pad of three layers' thickness and measuring five by thirty inches has been found very convenient to be used when first packing off the intestines. Many operators employ different-sized pads, but after experience with different methods it has been found that pads of one size simplify matters greatly. These pads have almost entirely taken the place of sponges, as pads are much more easily sterilized, less expensive, and they are almost as good absorbents as sponges.

Irrigation.—Formerly so generally employed even in clean cases is now restricted in the author's hands to cases in which it is desired to remove blood clots from the peritoneal cavity or other aseptic fluids or debris; it is therefore particularly applicable in ruptured tubal gestation with large quantities of free blood in the abdominal cavity. Water, preferably normal salt solution, poured into the peritoneal cavity from a pitcher raised six to twelve inches above the level of the patient removes these blood clots more rapidly and thoroughly and with less traumatism to the abdominal contents than any other procedure. In pus or other septic cases, however, it should be our aim to keep the process localized and prevent general contamination as much as possible.

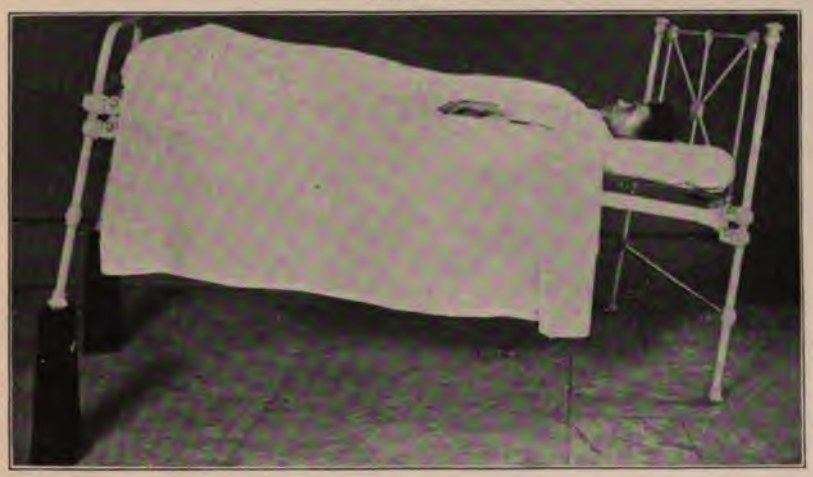
By general irrigation we are liable to scatter the septic material throughout the whole peritoneal cavity and cannot hope to remove it completely no matter how thorough the irrigation. In such cases the dry toilet by means of careful sponging and cleansing seems preferable.

Normal salt solution in various quantities is, as a matter of routine, poured into the general peritoneal cavity by many operators and left there for the purpose of stimulating the patient, preventing shock and the effects of loss of blood. In very anæmic cases such a procedure is certainly commendable and answers an excellent purpose, especially in prolonged operations accompanied by much loss of blood, but it should not be used without some special indication. Septic conditions

would be a decided contraindication to this method of treatment unless in the cases suitable for Clark's position (Fig. 252).

Adhesions.—When the omentum is firmly adherent in the pelvis, spread over the intestines like a tight veil, an effort should be made to loosen it up at its lower edge in the pelvis, examining it immediately and tying any bleeding points. If the attachments are so firm that the adhesions cannot be readily broken up we need not hesitate to tear through it at the most favorable point, so that the adhesions can then be reached behind the omentum from its under surface where separation is often more easily accomplished. The author never needlessly sacrifices the entire omentum or large portions of it, as it serves a very useful purpose (aside from its other special functions) as a protecting veil between the incision and the intestines and can often be utilized to

FIG. 252



Patient in Clark's position.

cover up large denuded surfaces in the pelvis and abdomen. Intestinal adhesions require much care and should never be attacked with brute force. Gentle coaxing with the fingers or wiping with a pad, cutting firmer bands with scissors between two hæmostatic forceps are the safest and easiest means to deal with them. When firmly attached to tumors it is better to sacrifice a portion of the neoplasm, when not malignant, than to endanger the integrity of the bowel. If small remnants of tumors have to be left attached to bowel the raw surfaces should be inverted so that if any peritoneum is left it can be stitched over it; if not it can often be inverted into the bowel, the same as an appendiceal stump, covering it over with intestinal walls. Injuries to the coats of the intestine should at once be repaired. When the walls are much infiltrated, as they are apt to be in bad pus cases in the pelvis, ordinary Lembert sutures for the purpose of repair will often tear out. Here the mattress sutures of Halstead answer a good purpose, and if

these will not hold, covering damaged intestine with healthy omentum, attaching it by a stitch or two, or peritoneal flaps from the uterus in cases of hysterectomy, will often render the work much safer. What has been said of the intestines answers equally well in bladder injuries. When working low down in the pelvis, especially for the purpose of controlling oozing, an electric light reflector of strong candle power for the purpose of illuminating the field of operation is a very useful adjunct to the instrumentarium of the abdominal surgeon and should be present in every well-equipped operating room. When operating on fat women the aid of such artificial light is often indispensable. Obstinate oozing from the uterus and pelvic walls and adhesions is often a very annoying feature and requires much patience as well as skill and experience to control it. All oozing should be completely checked, because some small quantities of blood left in the abdomen may, by acting as a culture medium for micro-organisms introduced during the operation or present at the time, seriously interfere with the normal convalescence of the patient. If a small surface only is the source of oozing, drawing that together by one or two sutures, thus compressing the bleeding surfaces may effectually check it. If, however, a large surface is oozing, prolonged sponge pressure, using very hot pads for that purpose, will frequently permanently control it. The application of astringents, such as perchloride of iron, recommended by good operators, is not a good and safe expedient, even though used carefully and in a diluted form; the cautery can only be condemned. Free bleeding can usually be stopped by the liberal and judicious use of ligatures; slight but persistent oozing, if not yielding to the measures mentioned, had better be treated by the temporary use of a glass drainage tube and gauze packing.

Drainage.—Drainage in abdominal operations like irrigation is now much less employed than formerly, but it still occupies an important position in the techniques. As a general rule it may be stated that no drainage is required in aseptic operations, an exception to this being the occasional cases with persistent parenchymatous oozing from raw surfaces left after extensive adhesions have been separated and which cannot be controlled in the usual way. In these cases the author prefers a small glass drainage tube placed in the lower angle of wound down to the bottom of the pelvis, removing it in a few hours when the bleeding has subsided.

The indications for drainage varies greatly in the hands of different operators, but even here the tendency is to limit it to as few cases as is compatible with safety. Complete and thorough operations, especially obliterating cavities and covering up raw and septic surfaces whenever possible, and finally a very careful toilet of the field of operation, with thorough cleansing of the parts with dry pads, will enable us to dispense safely with drainage in a large majority of septic cases. In a few, however, drainage is not only advisable, but essential and life-saving. The old adage, "When in doubt, drain," still holds good, particularly with the less experienced surgeon.

Methods of Drainage.—Simple postural method or Clark's position (Fig. 252) is based on the well-known absorbent properties of the peritoneum,

especially the diaphragmatic peritoneum particularly rich in lymph spaces, from which rapid absorption takes place. Clark advocates the leaving of about a quart of normal salt solution in the abdominal cavity, then raising the foot of the bed about eighteen or twenty-four inches for twenty-four hours. The normal salt solution helps to dilute the septic material, spreading it out over extensive peritoneal surfaces, including the diaphragm, thus eliminating it in the shortest time possible.

Most operators, however, rely on mechanical means for the removal of the septic fluid from the abdominal cavity. The glass drainage tube placed in the lower angle of the wound is still a favorite method with many, while perhaps the majority of operators prefer the capillary action of the gauze brought out either through the abdominal incision, or, when possible, through the vagina. The latter method has the advantage of permitting complete closure of the abdominal incision, thus doing away with the danger of hernia or weakened abdominal wall and the constant danger of infection with the persistence of an imperfectly drained sinus.

Indications for Drainage.—Indications for drainage may be briefly stated as follows:

1. In all abscesses walled off from the general peritoneal cavity which cannot be completely shelled out, as in appendicitis, gauze drainage should be employed, a long strip being loosely packed into the cavity in such a way that it will fill it out sufficiently to prevent contact with other surfaces. The end of the strip is left protruding from the wound.

The same rule holds good when malignant or necrotic tumors cannot be completely extirpated.

2. When intestines have been injured, particularly when the intestinal walls are infiltrated, thickened, and softened, so that careful suturing cannot be done, or when intestinal contents have contaminated the peritoneal or pelvic cavity.

3. When the tissues surrounding an abscess cavity are very much infiltrated and distinctly septic, as shown by an unhealthy grayish appearance. Such tissues should be carefully covered up with gauze and walled off from the general peritoneum.

4. In cases when large quantities of foul pus have escaped into the general peritoneal cavity. In such cases the author, preferring vaginal drainage when possible, assists the capillary action of the gauze by the introduction of a large firm rubber tube passed through Douglas' cul-de-sac into the vagina.

Fowler's Position.—In all cases when the pelvis is to be drained, either by glass drainage tube through the lower angle of the wound or per vaginam, a distinct advantage is obtained by placing the patient in Fowler's position. This consists in raising the head of the bed from eighteen to thirty inches, thus making use of the law of gravitation in the opposite direction from Clark's position, so that all free fluid which should be removed will be directed to the deepest portion of the pelvis

from which it is drained, either by gauze through the vagina or through the glass drainage tube by suction (Fig. 253).

Technique of Drainage.—The technique of vaginal drainage is as follows: The limbs of the patient are separated while an assistant introduces two fingers of the gloved hand into the vagina until they come in close contact with the posterior vaginal vault and can be easily felt by the operator's hand in the abdomen. The assistant's fingers behind the cervix are pushed up and separated while the operator plunges the edges of a long scissors through the tissues between them. As soon as the points of scissors are felt in the vagina the incision thus made is

FIG. 253

Patient in Fowler's position.

enlarged by opening the handles as the instrument is withdrawn. (Some operators prefer making the vaginal incision before opening the abdomen in septic cases, or in those conditions in which drainage seems indicated.) A large-sized rubber drainage tube about four inches in length is caught in a long dressing forceps and introduced from the abdomen through the cul-de-sac incision into the vagina about two inches. In order to prevent its slipping into the vagina or back into the pelvis the tube may be sutured to the edge of the vaginal incision or held by forceps. If hæmostasis is not complete and cannot be controlled with ligatures, gauze packing may be introduced through the vaginal incision beside the tube and drawn down into the vagina by the assistant's fingers. The remainder of the gauze is now carefully packed

into the pelvis in such a manner that it can easily be withdrawn after a few days through the vagina. A piece of iodoform or bismuth subgallate gauze two yards by four inches so folded and sewed that it is two layers thick and all free edges turned in is best suited for this purpose. In this connection it must be remembered that an essential step in the procedure is a thorough cleansing of the vagina which, as a routine measure, should be done before the cleansing of the abdomen.

The assistant, having drawn the gauze down into the vagina, cuts off the portion projecting at the vulva and packs a piece of fresh gauze into the vagina. He now removes his gloves, using a sterile pair for the remainder of the operation.

In removing the pelvic drainage we must be governed by circumstances. If the drainage is good, as can be seen by the soiling of the vaginal packing, the pelvic gauze and tube may be allowed to remain for five or six days. Should there be any evidence of retention of fluid, as is shown by increased temperature, accelerated pulse rate and pelvic distress and distention, the drainage may be removed at any time. If after five days drainage still continues, it is advisable to allow the rubber tube to remain, at the same time renewing a light vaginal packing daily. A modified Fowler position of the patient is also advisable until the drainage ceases.

Abdominal Drainage.—Abdominal drainage, when indicated, may be by either the capillary gauze or tubular method and sometimes a combination of both. The technique of its use is more simple than the vaginal drainage, but its disadvantages are greater. For the purpose a straight glass tube open at either end and long enough to reach from the bottom of the pelvis to an inch above the skin surface should be used. At the top the tube should be provided with a projecting rim or flange. Some prefer using a tube with small perforations near the bottom, but these perforations may become clogged with omentum and give rise to some trouble when removing the tube.

Before introducing the glass drain the pelvis should be dried as much as possible and the abdominal sutures introduced but not tied. The tube is then introduced to the bottom of the pelvis resting against the posterior wall of the uterus and the top part at the lower angle of incision. If the tube alone is used the abdominal sutures are tied, but if gauze and tube are employed the pelvis is packed with gauze, as was described under vaginal drainage, and the end allowed to project beside the top of the glass tube. The skin surface is thoroughly cleansed after the sutures are tied and dressings applied. Four or five layers of gauze are packed around the tube in addition to the usual dressings about the sutures. A thin piece of rubber dam perforated is slipped over the head of the drainage tube. A strip of sterile gauze is introduced a short way into the tube, the remainder of the gauze being used to cover the external opening. The rubber is now folded and pinned over this gauze. A layer of cotton and the usual dressing are now applied, and over this a six-tailed binder so adjusted as to allow the tube and its rubber protection to project above the dressings. A sterile towel is pinned to the binder

over the tube so that it can be easily removed and the tube drained without disturbing the other dressings. The glass drainage tube requires careful attention while it is in place. It must be emptied at regular intervals, say every half-hour to an hour, when there is a free discharge; during the interval it can be filled with a very slender strip of gauze carried to the bottom of the pelvis, which will carry away considerable fluid into the dressings surrounding the tube. When the tube is to be drained the towel covering the upper dressings is removed, and with the same aseptic preparations as for operation the rubber dam is unpinned and the tube drained. For this step a piece of rubber tubing a few inches longer than the glass tube is attached to the tip of a glass piston syringe. The rubber is introduced to the bottom of the pelvis and the accumulated blood slowly and carefully drawn out and measured. At first this fluid is dark colored, but as it diminished in amount it assumes a bright-red color and finally becomes serous.

If the drainage at first dressing exceeds four drachms it is advisable to repeat the suction process every one to three hours, lengthening the intervals of dressing as the character of the fluid changes. At the end of twenty-four or thirty-six hours the drainage is usually of such character as to warrant the removal of tube if that alone has been used.

Capillary drainage is considerably increased by making frequent changes of the gauze dressings placed around the drain situated in the vagina or in the abdominal wound. The gauze itself should ordinarily not be removed for at least from four so six days, because during the first few days the gauze firmly adheres to the tissues with which it is in contact, requiring considerable force to detach it. The removal of this gauze is not only very painful but not without risk, as more or less serious injuries may be inflicted, particularly to intestines whose walls are diseased or by causing annoying and at times dangerous bleeding. After four or five days the gauze becomes loosened from its attachments; its removal is easy and the above-mentioned accidents can be avoided.

Closure of Abdominal Wound.—The abdomen may be closed either by the *en masse* method or by the continuous tier suture. Either method has many advocates and the author has employed both, but after several years' trial has adopted the through-and-through method for the reason that catgut, no matter how prepared, is never absolutely reliable and may give way before union is perfect. This was shown by an experience with this method in a case in which the intestines were found lying on the abdomen after the fourth day, although chromicized catgut was used. Kangaroo tendon, however, is not so objectionable. Should there at any time be an infection at any part of the incision one or more silkworm-gut sutures may be removed and so not interfere with the others. These sutures are left in the abdomen for eighteen to twenty-one days, during this time supporting the abdominal wound by acting as splints. The tier method, while it probably gives the better cosmetic result, requires more time for its introduction. When abdominal drainage has been employed the through-and-through method should be used.

Closure by Interrupted Sutures.—When the abdomen is about to be closed and before the sutures are introduced all soiled pads should be removed from the abdomen and fresh ones introduced for the purpose of protecting the intestines and omentum during the insertion of the sutures. The peritoneum on either side of the incision is grasped by forceps and steadied, the assistant meanwhile exposing the several abdominal layers by drawing the skin away from the incision. The needle being introduced about one-fourth inch from the skin surface, includes in order the different abdominal layers and emerges on the peritoneal surface. At a corresponding point of the opposite side the needle is introduced again at the peritoneal surface and emerges at the skin in the reverse order to that in which it was introduced on the first side. Commencing at the lower angle, the sutures are placed in this manner at intervals of one-third and one-half inch. In order to keep the free ends of the sutures out of the wound the assistant secures them on each side in an ordinary hæmostatic forceps. After all the sutures have been introduced a finger is inserted into the abdomen for the purpose of removing all pads and at the same time drawing the omentum down over the intestines. At this point it is important to have an exact final count of all pads that were used during the operation. If the pads are arranged in bundles of six, and six such bundles in one package, the count is easily made, as the final count must be a multiple of six. The head nurse should have care of the pads as they are removed from the abdomen, and immediately before the abdomen is closed she should tell the first assistant the number of pads on the floor. The pads unused, added to those in charge of the nurse, should total thirty-six or a multiple of six. In this way the responsibility of pads rests with the first assistant and the first nurse. The pads having been all accounted for, the ends of the sutures on either side are lifted up, in this way drawing the abdominal wall away from the intestines. While the sutures are being held up pressure should be made on either side of the wound so as to bring the margins of the peritoneum together.

As the fascia is the most important structure in the prevention of an incisional hernia, it is well to reinforce the approximation of that tissue, and for this purpose buried catgut or kangaroo tendon may be used. The fascia on either side should be well exposed, and if necessary part of the sheath of the recti muscles may be dissected free. If the silkworm-gut or silver wire is used, the needle is introduced at the skin surface about one-half inch below the angle of the incision and emerges below the fascia. The needle enters the fascia on one side near the lower angle and parallel to the incision and is brought out about three-fourths of an inch on the same side. The needle now enters the fascia on the other side at the point opposite to whichh it emerges and a similar stitch is made. This is continued until the upper angle is reached. The needle here is introduced under the fascia and emerges at the skin about one-half inch above the upper angle. By drawing on both free ends of the sutures the fascia is brought into close approximation, and if the silkworm-gut ligature is smooth and properly introduced there should be

no difficulty in removing it. Some operators prefer to use buried silver wire for the purpose. If catgut is used for the fascia it is introduced at the lower angle and the fascia brought together with a continuous suture. The incision should now be thoroughly wiped and the sutures tied, care being taken that they are not drawn too tightly, as more or less strangulation may result which frequently interferes with union by producing a tissue necrosis. If silkworm gut has been used the knot is made by taking two turns and then securing it by another single turn. This method gives good approximation, but in order to make perfect coaptation of the skin surface it is well to introduce superficial silkworm sutures between the deeper ones after the latter have been tied. These sutures are not removed until about the eighteenth day, when it is found that union is perfect. If any suture should cut through or show evidence of irritation, such as redness and swelling before the eighteenth day, it may be removed at any time.

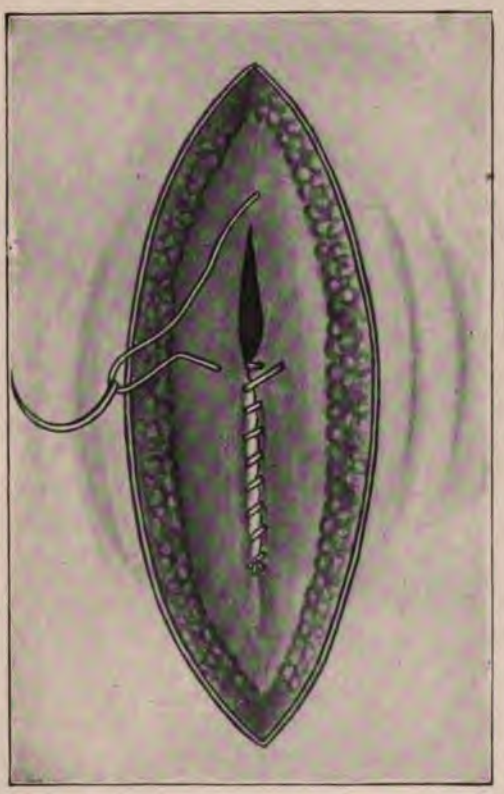
Closure by Tier Suture.—When the tier method of closure is employed a most essential factor is sterile catgut or kangaroo tendon so prepared that it will not become absorbed for from two to three weeks. In suturing it is necessary to have each structure so exposed that it alone will be included. There are many individual modifications of suturing, but in the main the following steps are observed: A pad with tape attached is introduced to cover the intestine. The edges of the peritoneum are picked up with tissue forceps or light volsella, the suture introduced at the upper angle and tied. It is desirable to have as little catgut material as possible buried and therefore it is better to use the running suture instead of the interrupted. Before reaching the lower angle the pad should be removed, the suturing being continued until the peritoneum is completely closed. A knot may be tied, or, with the same suture, the muscle along its whole length may be brought together. The fascia is the next layer, and as has been mentioned before, particular attention must be paid to this step. In order to strengthen this layer some operators use two or three mattress sutures in addition to the continuous suture. In order to secure accurate apposition and firm union of the aponeurosis of the abdominal wound the author employs the following technique: A fine catgut suture is introduced in the fascia about 1 mm. below the lower angle of the incision and tied. The fascia on the left side being well exposed, the needle is introduced at right angle to the incision about 10 mm. and emerges at about 5 mm. from the edge of the upper surface. The needle is now introduced into the fascia on the right side from the under surface at about 5 mm. from the edge. By drawing the suture taut the aponeurosis of the right side overlaps that of the left side (Fig. 254). The suture should be introduced in a continuous manner about 1 cm. apart until the upper angle is reached, where the catgut is tied and the free ends cut short (Fig. 255).

This method of suturing the aponeurosis is quickly accomplished and has the additional advantage of making the fascia double at the place where hernia usually occurs without any previous dissection or

preparation of the fascia as required in other procedures. It was devised and used first by Noble, of Philadelphia.

If there is a thick layer of subcutaneous fat it should be sutured separately in order to prevent the formation of pockets. The wound is completely closed by next uniting the skin surfaces, which may be done best by means of the subcutaneous suture, or if the incision is long or time an element the running suture may be used. In using the subcutaneous suture the end should be secured by tying the knot in the

FIG. 254



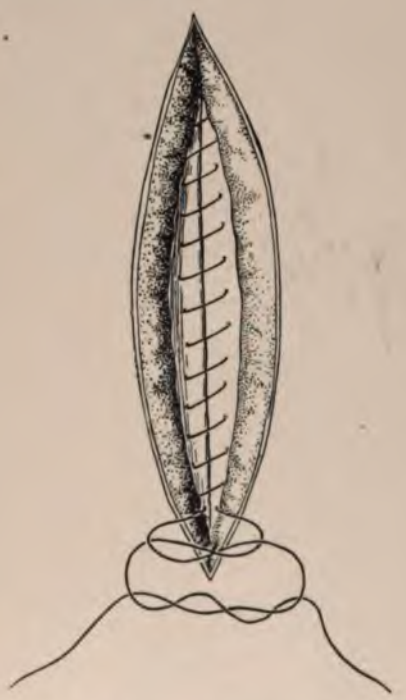
Showing method of suturing to overlap fascias in closure of abdominal wound.

subcutaneous fat and cutting the short end close. In this way the knot is buried and will be more quickly absorbed than when it is more superficial. In introducing the first subcutaneous suture the needle should be directed toward the end from which it started in order to prevent gaping of that angle. The skin surfaces are next brought into close approximation by a continuous catgut suture threaded on a curved needle. As the needle is introduced each time the skin margin should be exposed by means of light tissue forceps. The needle is directed

away from the starting point and each bite includes only the subcuticular tissue. The skin margin should be drawn closely together so that there are no gaping points; at the same time the suture should not be drawn very tightly, as too much pressure would be destructive to the integument (Fig. 256).

Dressing.—The wound should be cleaned with bichloride solution and sterile water and then carefully dried. If silkworm has been used sterilized iodoform gauze is placed close around and above the sutures

Fig. 255



Showing method of tying suture at end of incision in fascia.

Fig. 256

Showing method of placing subcuticular line of sutures.

and over this a layer of sterilized cotton. Where the subcuticular stitch has been used a few layers of gauze large enough to extend a few inches beyond the wound in several directions is placed immediately over the incision and iodoform collodion applied to the margins of the gauze. Over this is placed a layer of cotton and this secured in place by a few strips of zinc oxide adhesive plaster. A binder, preferably a six-tailed bandage, is now applied. Particular attention should be paid to covering the lower part of the incision for it is usually at this point that secondary infection occurs.

CHAPTER XX.

ABDOMINAL OPERATIONS: THEIR AFTER-TREATMENT AND COMPLICATIONS.

By J. RIDDLE GOFFE, M.D.

SECONDARY HEMORRHAGE.

ANY serious complication which may arise after an abdominal operation usually declares itself within forty-eight hours. The most alarming of these is hemorrhage. When it is severe it means that unless it can be controlled, and that too with promptness, the fate of the patient is sealed. The interference necessary to control it is so serious and the absolute diagnosis, except in cases having external drainage or very pronounced symptoms, so difficult that the condition is one of the most trying that the surgeon is called upon to face.

Hemorrhage may be due to a gentle oozing, coming on directly after the abdomen has been closed but not declaring itself for several hours. It may be that an important ligature has become untied, or slipped the pedicle, or there may have been shrinkage of the tissues within its grasp.

The symptoms may appear promptly or be delayed in accordance with the activity of the hemorrhage and the resisting power of the patient. The bleeding from areas of raw surface due to the pulling off of the adhesions may continue irregularly for a day or two with the loss of several ounces of blood, but not productive of serious symptoms. Unless the field is septic this will be absorbed. Hemorrhage from one of the uterine or ovarian arteries, hemorrhoidal branches or an enlarged vessel in the omentum is apt to be very rapid and produce symptoms more or less pronounced in a few minutes or hours. The first loss of blood produces a sudden shock from which the patient may recover spontaneously and then gradually develop the characteristic train of symptoms. The first symptom of hemorrhage is a quickening of the pulse, either suddenly or gradually with diminished volume. The legs and arms become cold. The radial pulse beats persistently fainter and fainter and finally fails altogether. The patient grows apprehensive, the face loses color and becomes waxy pale, the lips purple, and the mucous membrane blanched. There is air-hunger and deep sighing respirations break the respiratory rhythm. Restlessness becomes a marked symptom, the head is tossed from side to side and the arms and legs are thrown about. The abdomen becomes distended and is the seat of pain. In case of sudden and extreme hemorrhage

the temperature becomes subnormal, but in a moderate and continued loss of blood there may even be a rise of a degree or more.

Diagnosis of Postoperative Hemorrhage.—To a surgeon familiar with the course of a normal convalescence a mere glance or the most superficial inspection of the pulse and condition of the skin in a case of hemorrhage arouses his suspicions that all is not well. The color of the face, the expression of the eyes and countenance are the first to attract attention. If a gauze drain has been left in the abdomen it will prove a prompt tell-tale. An alarming or excessive hemorrhage will declare itself by staining the dressing and binder. A slighter effusion of blood or a prompter investigation may find these unsoiled, but the gauze as it issues through the wound saturated. Hemorrhage may have ceased, but if on starting or pulling out the gauze the flow comes actively the necessity for interference is present. The general condition of the patient must be taken in consideration in deciding what to do. The brightness of the blood is an indication of the present activity. Without gauze or other drain, either through the abdominal wound or the vagina, the diagnosis must rest upon the symptoms. Hemorrhage must be differentiated from shock. At the same time it must not be forgotten that hemorrhage is one of the most fruitful and common causes of shock. Such shock may come as a result of the loss of blood while on the operating table. No condition is more difficult to distinguish from an oozing hemorrhage than that slowly progressing depression due to simple nervous shock. The confidence of the surgeon, although this should not be overweaning, or his suspicion regarding the security of his ligatures and his general hæmostasis, and his knowledge of the staying quality of the tissues ligated, are of assistance in reaching conclusions. The circumstances productive of shock in the case under consideration must be reviewed and weighed carefully, such as prolonged anæsthesia, even moderate loss of blood in an anæmic patient, excessive hemorrhage in a robust subject, lack of constitutional resisting power due to prolonged or septic disease, prolonged exposure of the intestine and omentum, all must be taken into consideration. When a positive diagnosis has been made the question of treatment must be determined promptly.

Treatment of Secondary Hemorrhage.—Not all cases of secondary hemorrhage require operative treatment. No case should be subjected to a secondary operation for hemorrhage except in the presence of positive indications. A secondary operation is a most exhausting ordeal for the patient. At the same time it must not be forgotten that many a patient *in extremis* from hemorrhage has been actually snatched from the grave by a seemingly hopeless intervention. Many a case has also been opened to find that hemorrhage has ceased and the secondary operation thereby rendered unnecessary. The determining point is the continuance of serious active hemorrhage. In desperate cases open at once even if the operation must be done on the bed and without sterilization. In cases that permit of proper preparation the same scrupulous care that was practised in the primary operation, both for

surgeon, patient, instruments, nurses, and assistants, is mandatory. Many cases presenting the symptoms of moderate hemorrhage may be relieved by less heroic methods than opening the abdomen. In all of them, however, the secondary operation must be kept in mind as a last resort. In two cases recently the author has saved the patients in the face of undoubted internal hemorrhage by elevating the foot of the bed, not six inches but two feet, securing a complete Trendelenburg posture, giving a hypodermic injection of one-fourth grain morphine to quiet the patient and the heart and administer every two hours for three doses hypodermically Parke, Davis & Company's aseptic ergot, ℥ss. In one case a quart of saline solution was injected under the breasts and in the other into the rectum. An ice-bag placed above the pubes seemed also beneficial; one of the patients was a frail, delicate woman for whom a secondary operation seemed fatal.

In operating for secondary hemorrhage the bleeding point should be reached as speedily as possible. If the blood comes from the stump of a salpingo-oöphorectomy or a hysterectomy no time need be lost in cleaning out the blood; the offending tissue should be sought by the hand and held firmly while the clots are being cleared away or until it can be brought up into the wound and a clamp or ligature applied. If any uncertainty exists as to the side from which the hemorrhage comes seek out by touch and grasp first the tissue of one side, securing it in a forceps, and then the other. The pelvis and abdomen can then be cleared of the blood and clots and the stumps permanently secured. The condition of the patient must be considered in deciding how much time should be spent in the toilet of the peritoneal cavity. It is unnecessary to put any extra strain upon the woman for the purpose of seeking out all the clots and blood. If there is no infection natural forces will effectually dispose of a surprising amount of blood left in the peritoneal cavity. The nice adjustment of the tissue in the abdominal wall is not to be considered in closing the wound if the patient is in a desperate condition, and she usually is. Sew the incision with through-and-through sutures and get the patient to bed as soon as possible.

An intravenous injection of normal salt solution before the wound is opened is sometimes desirable. It fills the bloodvessels, stimulates the heart, and so allows of greater deliberation and care in the major procedure. The amount of saline solution to be injected is important. In a severe and sudden hemorrhage the infusion may be begun previous to the operation and continued during the operation as long as the pulse improves, up to the maximum amount of three pints. In the mean time the vessels have been ligated and the infusion retained in the bloodvessels. There is no doubt that in many instances serious harm is done by throwing a large amount of fluid into the veins, in some instances the hemorrhage has stopped spontaneously only to be renewed by the sudden increased pressure on the hæmostatic clots driving them out of the vessels. In other cases an oozing that otherwise could have been controlled by renewed or increased gauze tampon and elevation of the foot of the bed is intensified. Except in desperate cases demand-

ing the promptest relief, salt solution given by high rectal injections or hypodermoclysis, which increase pressure more gradually and naturally, is preferable to infusion. The same opinion is held by surgeons who have had experience with both methods in perforative hemorrhage of typhoid fever.

SHOCK.

Shock is a depressed condition of the system, characterized by a livid pallor, clammy perspiration, a small, sometimes imperceptible, rapid pulse of low tension, and relaxation of the sphincter muscles more or less marked. The mental condition is usually lethargic but may be excited. There is a condition of arterial anæmia but venous engorgement. The latter is apparent in the bluish color of the mucous membranes and finger nails. When the shock is due to hemorrhage the bluish color is absent. There are two theories to account for the profound disturbance of the vasomotor and sympathetic systems in shock. One claims a paresis of the arteries and heart, and the second insists that the symptoms are produced by an excessive irritation of the sympathetic nerve centres causing spasm of the heart and arteries.

Dana in Quain's *Dictionary* says: "Shock is essentially a reflex vasomotor paralysis with cardiac inhibition, the effect being produced through the vagi, depressor, and other nerves."

Mansell-Moullin (also Quain's *Dictionary*) says: "Shock is an example of reflex paralysis in the strictest and narrowest sense of the term, a reflex inhibition affecting all the functions of the nervous system."

To me the most satisfactory explanation of shock is that presented by Eugene Boise, of Grand Rapids, at the 1901 meeting of the American Gynecological Society. He says: "When we regard surgical shock from the standpoint of the clinician and when we reason from physiological facts, which are beyond dispute, to the conditions which we see in shock, we are forced to the conclusion that the true pathology of uncomplicated shock is a hyperirritation (a spasm) of the entire sympathetic system." It is a tetanoid condition, not a paralysis. On this theory all of the observed phenomena of shock are logically and satisfactorily explained.

Causes.—Shock following operation may be attributed to any one of a number of causes or to a combination of two or more. Prolonged anæsthesia, exposure of the intestines, more especially when lifted out of the abdominal cavity, and hemorrhage are the contributing factors to shock. The symptoms may show themselves while the patient is still upon the operating table and directly after or may be delayed for hours.

Treatment.—In all cases in which shock may be anticipated from the reduced physical condition of the patient due to previous hemorrhage, debilitating disease, or inactive kidneys, preventive measures must be adopted. The patient should be made ready to meet the strain by such constitutional treatment as may be indicated; the temperature of the operating room should be elevated to 75° or 80°; the patient's extremities

wrapped in warm blankets; the period of anæsthesia shortened as much as possible by complete preparation for work before it is begun; by taking unusual precautions against loss of blood, clamping and ligating promptly all points, and making the duration of the operation as brief as the circumstances will permit.

If symptoms of shock develop suddenly, either during the operation or directly after, the immediate treatment must be prompt and energetic. Hypodermic treatment has here its fullest indication, strychnine, gr. $\frac{1}{30}$, or nitroglycerin, $\frac{1}{100}$, combined with whiskey or brandy, ʒss, and repeated in half an hour or an hour as may be indicated. Morphine, gr. $\frac{1}{4}$, should also be given and rectal enemata, hypodermic injection, or intravenous infusion of two or three pints of hot saline solution. If the reaction does not set in promptly the dose of morphine may be repeated. Morphine is the sheet-anchor. Black coffee and whiskey may be given later per rectum, as indicated by failing strength or supervening collapse.

POSTOPERATIVE PERITONITIS.

Varieties.—There are two forms of peritonitis following operative procedures in the pelvic or abdominal cavity—the traumatic or simple peritonitis and infectious or septic. Undoubtedly both varieties originate in infection, the difference consisting in the virulence of the infecting germ. A variety of septic peritonitis met with after operation is characterized by low-grade temperature with extreme excursions preceded by chills. This is a purulent peritonitis and is due to an infection by some of the pus-forming bacilli, the staphylococcus, the bacillus coli communis, the gonococcus, or the aërogenes capsulatus.

Traumatic Peritonitis (Postoperative).—After every abdominal or pelvic operation that invades the peritoneal cavity it is customary to have some evidences of inflammation. They may be very slight and evanescent. And on the other hand they may be severe and alarming. It is customary to speak of a convalescent whose general condition is favorable, no vomiting or simple in character, clear eye and bright countenance, but whose temperature may have reached 100° or even 101°, with associated rapidity of pulse, as having a normal convalescence. This rise of temperature may appear on the second or third day, entirely disappear on a free movement of the bowels and return no more. Unquestionably there has been a slight invasion by some comparatively mild infection which the resisting power of the patient is able to withstand by a simple stimulation of the eliminating functions. This infection may be in the wound itself or in the peritoneal cavity. If the latter, the condition is known as traumatic peritonitis.

Symptoms.—In simple or traumatic peritonitis the temperature may rise 1° or 2°, the pulse reach 100 to 110, accompanied with pain in the abdomen and occasional vomiting. The pulse keeps comparatively full and soft, the vomiting is not attended with severe retching or the emission of greenish material, but consists in the spitting up of

whatever may have been taken into the stomach. The mental condition of the patient and the facial expression are the features that give sustaining confidence to the attending surgeon at this time. Unless sepsis is setting in the eyes are bright and the face free from drawn expression characteristic of sepsis. During this time plastic exudate is being secreted over and about the raw surfaces that have been produced by the separation of adhesions. This exudate, as a rule, is gradually absorbed by an abundant secretion of serum. If, however, infecting germs be present to stimulate this protective process the exudate may become organized into fibrous tissue and permanent adhesions.

Septic Peritonitis (Postoperative).—This is the most serious complication that can arise in the after-treatment of abdominal operations. It is the result of invasion of the peritoneal cavity by some infecting micro-organism. The pyogenic or pus-producing organisms are apt to remain localized for varying lengths of time, producing a locule or locules of pus at the seat of invasion. These locules, unless evacuated, become foci, from which absorption occurs, and other deposits are established by metastasis. The most common of these invading germs are the staphylococcus albus and aureus, the bacillus coli communis and gonococcus. The gonococcus, although one of the most fruitful sources of pus in the female pelvis, producing most of the destructive ravages upon the ovaries and tubes, and formerly considered a most dangerous inciter of postoperative peritonitis, is now regarded as a comparatively harmless factor in operative work. This statement has reference to chronic cases, but is not applicable to acute conditions. It must not be forgotten, however, that more purulent germs are apt to accompany it in its invasions. Kelly says: "The gonococcus, while occasionally found in purulent collection in the peritoneum, seems only in rare instances to possess the power of exciting an active inflammation of the serous membranes." In hundreds of bacteriological examinations I have never yet been able to demonstrate this micro-organism as the etiological factor in the production of septic peritonitis. It is well known that the life of the gonococcus is comparatively short, and that collections of pus occasioned by this organism, whether in the tube, the ovary, or the pelvic peritoneum, frequently prove sterile at operation.

The most virulent infecting germ that can invade the peritoneal cavity is the streptococcus. This micro-organism multiplies so rapidly and manufactures its toxic products with such speed and in such abundance that in most instances the system is powerless to establish any barriers against the invasion. The bacillus and the toxins are absorbed rapidly by the blood and the lymphatic vessels, the nerve centres are overwhelmed and the patient dies without the possibility of relief. The symptoms of peritonitis may be very slight, the constitutional conditions being serious from the first. This is known as the true sepsis or blood poisoning. The invasion may take one of two forms. The course of infection may be fulminating from the start, the most violent symptoms

declaring themselves within twenty-four hours. On the other hand the generation of toxins may progress gently and insidiously for three or four days, the temperature not rising above 101° or the pulse above 110, when suddenly the temperature jumps to 104° or 105° and the pulse to 160 or 180, violent vomiting occurs, the entire system is overwhelmed, and the patient dies without the slightest reaction.

Each of the symptoms of traumatic peritonitis may gradually take on a violent form, the temperature jumping to 102° or 103°, or higher, the pulse become more rapid, small and wiry, the abdomen greatly distended, the pain intense, the vomiting violent and bilious in character and the features pinched and drawn. It becomes apparent then that the peritonitis is septic and the condition of the patient most serious. Still more indelibly is this conclusion forced upon the observer if these symptoms are violent from the start, a fulminating peritonitis due to the streptococcus.

Prognosis.—The prognosis in any case depends upon the course of convalescence during the first forty-eight hours. If at the expiration of that time the patient's bowels have moved freely and the urine is being voided naturally, the probabilities are that the convalescence will be free from any complication dangerous to life. If symptoms of peritonitis develop the outcome depends almost entirely upon the infection. In cases of streptococcic infection the peritonitis becomes general with an absorption of toxins that overwhelms the nerve centres and has but one termination, death. Or there may be no marked signs of peritonitis. The infecting colony of germs may be confined to a very circumscribed locality where incubation goes on silently but swiftly and the product of the toxin factory is being as silently absorbed until it suddenly bursts forth in irresistible power and carries the patient inevitably to her long home. The experienced vision recognizes these exceptional cases as fatal from the first. Occasionally, however, by instituting prompt and desperate measures a patient is rescued, and it behooves the attendant to make an active and strenuous fight to the last. In the milder forms of infection the outcome of a watchful, persistent effort is favorable and should be prosecuted with confident courage.

The prognosis depends: first, upon the kind of infection; second, upon the number of organisms in the invasion; and third, upon the powers of resistance of the patient. As a rule, in the pyogenic forms of infection the condition is amenable to treatment and the prognosis favorable. If the streptococcus is the invading germ the case is serious from the first and recovery is the exception.

Treatment.—Whatever the form the earlier purgation can be accomplished the better the chances of the patient. Every effort must therefore be directed to this end, the methods of which have been discussed under the care of the bowels (page 487). The kidneys and the skin must also be stimulated by high hot saline enemas of two to three pints, or by hypodermoclysis, using an equal amount. As soon as all these emunctories have been stimulated to activity morphine should

be given in doses of ¼ gr., hypodermically, to relieve the pain and quiet nervous excitement. If the stomach continues irritable it may be flushed out by large draughts of hot water or by lavage through the stomach tube. A free catharsis on the second or third day will relieve the intestinal congestion, improve the circulation, and serve actively to prevent the vascularization and organization of the plastic exudate which follows. Calomel given in quarter-grain tablets every half-hour for six doses, followed in six or eight hours by a saline cathartic, is the routine treatment. The calomel is efficient frequently in settling an irritable stomach, and, together with the saline, produces a free evacuation. If the bowels do not move within three hours after the saline is given a stimulating enema of turpentine and soapsuds, one-half ounce to the quart, will usually be effectual. In the mean time light diet, such as peptonized milk, milk and lime-water, a drachm of each; koumys, or iced champagne, may be given in small quantities (teaspoonful doses) every hour. If these efforts of moving the bowels are not effectual, and the patient is nervous, in pain, or suffering more or less from shock a quarter grain of morphine administered hypodermically will afford several hours of rest to the patient, after which the bowels will frequently move spontaneously. Upon free evacuation of the bowels all the symptoms of inflammation are frequently relieved and convalescence goes on without interruption. A rise of temperature later to 100° or 101° indicates some formation of pus. This may be located in the abdominal wall, running on to a stitch-hole abscess or, of course, may be connected with the deeper tissue. Daily watchfulness and careful examination will reveal the location, whereupon prompt evacuation is in order. If, however, the temperature and other symptoms are not eliminated or markedly diminished by the evacuation of the bowels, the temperature continues to rise and the attending symptoms to become more aggravated, it will shortly become apparent that a septic infection is to be faced. Nourishment should be judiciously but generously supplied by mouth and rectum and stimulation by strychnine and alcohol as indications demand. In constitutional sepsis alcohol in some form, whiskey and brandy, is the sheet-anchor.

In sthenic cases with great resisting power, especially those characterized by pus formations as indicated by chills and extreme excursions of temperature, or by a simple daily rise of temperature, thorough examination of the abdomen should be made to discover evidences of localized points of inflammation or suppuration. Points of hardness may be revealed in the abdominal wall or areas of dulness or of fluctuation in the pelvis surrounded usually by the tympanitic note. Still better for discovering these evidences in the pelvis is the examination by the vagina. Fixation of the cervix and the fundus with hardened or fluctuating areas at one or both sides or in Douglas' pouch tell the story and point the way to relief. Operative procedures are then in order. The vaginal route is far the safer and best way to reach the fluctuating point if the vaginal touch reveals them, otherwise it may be necessary to open the abdominal wound, usually at the lower angle, and explore

the pelvis with the finger. The index finger is gradually insinuated between the lips of the wound, turned down toward the symphysis, and pushed on over the top of the bladder to the fundus and down along the posterior wall to the bottom of the pelvis. From this point it is carried along the posterior face of the broad ligament, first on one side and then the other. If pus is met at any point it should be evacuated before exploring further, but the striking of one pocket of pus should only stimulate to further examination along the lines indicated. This may be assisted by the finger of the other hand in the vagina, care being observed at all times not to thrust the finger out into the outlying coils of intestine unless areas of hardness or fluctuation are felt. If pus is met promptly upon penetrating the abdominal wall and the pocket is circumscribed it may be sufficient to cleanse it and pack it lightly with gauze, leaving the end protruding at the lower angle of the wound. In extensive or multiple locules in the pelvis it is best to follow a passage freely down to Douglas' pouch, open into the vagina and secure through-and-through drainage, first by gauze and later by rubber drainage tube.

If a general peritonitis exists the surgeon must decide upon opening the entire wound freely, lifting out the coils of intestine, washing them thoroughly with saline solution, cleansing the abdominal and pelvic cavities and restoring them to normal condition, leaving gauze in the pelvis and the lower angle of the wound, or content himself with breaking up adhesions freely with his hand, carrying in an irrigating tube with which he flushes the parts, finally stuffing the pelvis with iodoform gauze, bringing the end out either through the vagina or the abdominal wound. The extent of the inflammation and the resisting power of the patient determine the procedure of choice. If the condition is desperate it justifies desperate means.

If a generalized peritonitis is encountered the more radical treatment of opening up the entire wound and flushing out the peritoneal cavity, or even disembowelling the patient and systematically swabbing the entire peritoneal cavity and coils of the intestines, is to be considered. The latter is a desperate undertaking and few patients have the vitality to withstand the shock. And it may also be said that few surgeons have the temerity to undertake it.

ILEUS.

Ileus is an interference with the physiological peristalsis of the intestines, causing a partial or complete stoppage of the bowels. It may be due to paralysis the result of infection, to adhesion of the bowels to the new surface, to a simple twist of a loop of intestine upon its own axis, to the incarceration of a knuckle of intestine under adhesive bands, or to the strangulation of a loop of intestine through a hole in the omentum. Ileus, like stitch-hole abscess and fecal fistula, is one of the later complications of convalescence. The first symptom of ileus is difficulty in moving the bowels. As the obstipation becomes more

complete a griping pain distinctly localized at some part of the abdomen sets in, recurs at intervals of a few minutes, gradually increasing to an acme of intensity and then subsiding. Nausea and vomiting are violent, the contents of the intestine above the seat of obstruction regurgitated into the stomach and the character of the ejecta gradually changes from simple contents of the stomach to bile mingled with mucus, and finally to fecal matter—the stercoraceous vomiting. If the seat of ileus is in the large intestine the abdomen becomes uniformly distended, tympanitic, and tender. When the obstruction is in the small intestine the distention may be confined to a limited area of the abdomen, and in patients with thin abdominal walls the peristaltic wave may be seen or be felt with the hands. At the height of the paroxysm the muscular contraction may be sufficiently firm to simulate a fibroid tumor. The condition is rapidly exhausting to the patient. At the height of the spasm the suffering becomes intense, the patient cries out with pain and then sinks prostrated, bathed in a cold sweat. If not relieved she soon succumbs to exhaustion or gangrene and peritonitis. If peritonitis does not supervene, however, the patient may live many days, sustained by carefully regulated enemata and such feeding by the stomach as is tolerated. An illustration of this is a patient that was subjected to vaginal panhysterectomy for double gonorrhœal salpingo-ovarian abscess. She was a delicate little prostitute, emaciated, and exhausted from her long illness and still septic. She nearly died upon the table from the depression of the anæsthetic and the shock of the operation. An intravenous saline infusion revived her and she was placed in bed with the feet well elevated. She revived and slowly but steadily improved for a week, when she began to develop signs of ileus. Cathartic medicine when given was retained for several hours and then vomited without producing an action of the bowels. Light diet was retained and more or less completely digested and assimilated, vomiting occurring once in twenty-four hours. Nutritive enemata were given regularly and the bowels irrigated once each day by a high saline. The peristaltic action was feeble and no great pain was present, although a sensitive area could always be located just above the umbilicus. She progressed well for five days under this treatment and then began to show signs of failing strength. She was therefore subjected to laparotomy. No general peritonitis was present, but just below the transverse colon was a firm knuckle of small intestine, some surrounding adhesions, and a locule of pus, about half an ounce. The walls at the apex of the knuckle were collapsed and gangrenous. The cavity was carefully cleansed, the intestines lifted out and a lateral anastomosis done, but the patient did not survive the shock. Undoubtedly some septic material, due to the Trendelenburg posture in bed following the primary operation, had gravitated to the seat of obstruction, set up a localized peritonitis, and caused the ileus.

Treatment.—The treatment of ileus consists in prompt execution of every known means of moving the bowels by medicines combined with rectal and high injections until it is evident that they are of no avail. In addition to the suggestion made under Treatment of the Bowels,

resort may be had to the faradic current applied with one pole at the sacrum and the other circling the bowels like the hands of a clock. These efforts should not be continued too long, but resort had to operative interference as soon as it is evident that nothing else will avail. If the operation has been a vaginal one the packing should be removed and an effort made to reach the obstruction with the finger. When done aseptically this gives slight disturbance to the patient and is free from danger. It is effectual in many cases. If the operation was laparotomy the incision must be opened and tentative efforts made to locate and free the adhesions with the sense of touch. Failing in this the entire incision may be opened, the intestines carefully lifted out into hot moist gauze pads, and the obstruction located, such measures being adopted as the situation demands.

FECAL FISTULA.

In all the cases in which the bowel has been penetrated during the operation, and in any case in which it has been wounded to a degree suggestive of the possibility of later rupture, a gauze drain should always be inserted before closing the abdominal incision. If the tear is in the sigmoid flexure or in the rectum large quantities of gauze should be used to absorb any leakage and make a large well for the future treatment of the fistula in case it occurs. Many cases packed in this way may have one, two, or three movements of the bowel on the second, third, or fourth day without any evidence of leakage appearing. In the mean time adhesions have formed about the gauze and the general peritoneal cavity is safe. If, upon removal of the gauze or previously, leakage declares itself, the gauze must all be removed and the cavity frequently irrigated. Openings in the rectum or sigmoid will heal under frequent and prolonged irrigation, but the process is greatly facilitated and the healing hastened if a counteropening has been made into the vagina through Douglas' pouch and through-and-through drainage established. If the opening is into the small intestine the digestive ferments eat away the tender granulations and prevent closure.

Under these circumstances the fistula must be sought out and stitched up to produce a cure. At the time of the primary operation it is well to place a wounded intestine, upon closing the abdominal incision, as near the incision as possible so that it may be readily reached in case fistula develops. The intestine will then adhere to the abdominal wall and its location be permanently fixed. In operating to close the fistula it is a good device to surround the external mouth of the fistula with an incision and dissect out the fistulous tract, keeping it carefully intact down to the intestine. This obviates any possibility of infecting the surrounding peritoneum. The tract with its surrounding tissue serves as a handle and guide in lifting out the intestine. In dissecting out the tract as soon as the peritoneum is reached the incision through the abdominal wall may be enlarged to either side to avoid wounding

the intestine and afford room to work. The edge of the opening into the intestine must be freshened and the opening closed by layers of Lembert sutures, or in extreme cases it may be necessary to resect the bowel.

OTHER COMPLICATIONS.

Pyemia, pleurisy, and pneumonia are complications that sometimes arise. Pyemia is rare in these days, and pleurisy and pneumonia are to be treated on general principles.

Nephritis and suppression of the urine are complications of frequent occurrence. Indeed, the function of no organ demands more careful and constant attention after operation than the kidney.

Cystitis is a very common and most mortifying complication, but is not peculiar to the convalescence after abdominal section. If the urinary tract were free from infection previous to the operation the responsibility for the infection rests usually with the nurse. To avoid the possibility of infection, even with the best trained nurse, it is a safe rule to prohibit the use of a catheter unless absolutely necessary.

CHAPTER XXI.

ANATOMY OF THE FALLOPIAN TUBES AND OVARIES—DISEASES OF THE FALLOPIAN TUBES (EXCLUSIVE OF INFECTIONS AND EXTRAUTERINE PREGNANCY).

By BENJAMIN R. SCHENCK, A.B., M.D.

ANATOMY OF THE FALLOPIAN TUBES AND OVARIES.

Location.—The Fallopian tubes and ovaries are located in the true pelvis, between the uterus and the pelvic wall and are held in place by the various reflections of the peritoneum, forming the broad ligaments, portions of which are sufficiently prominent to have received distinctive names.

The Broad Ligaments.—The broad ligaments, usually described in connection with the uterus, bear such an intimate relation to the tubes and ovaries that a brief description of them is here included. They are formed, on either side of the uterus, by two broad folds of peritoneum, intimately bound together by a small amount of areolar and loose connective tissue and extend from the sides of the uterus laterally to the pelvic wall.

As seen from above, the ligament presents three distinct folds, separated by two well-marked grooves. The anterior of these folds is the peritoneal reflection over the round ligament; the middle and most prominent is the reflection over the tube; while the posterior forms the mesovarium and the reflection over the utero-ovarian ligament.

In the connective tissue between the two layers of peritoneum run the nerves, lymphatics, and bloodvessels. The latter are branches of the utero-ovarian anastomosis, the uterine portion of which enters the broad ligament from the lateral margin of the uterus, just below the insertion of the tube, while the ovarian portion, derived from the abdominal aorta, reaches the broad ligament at its upper and outer angle, through a special band, termed the *infundibulo-pelvic ligament.*

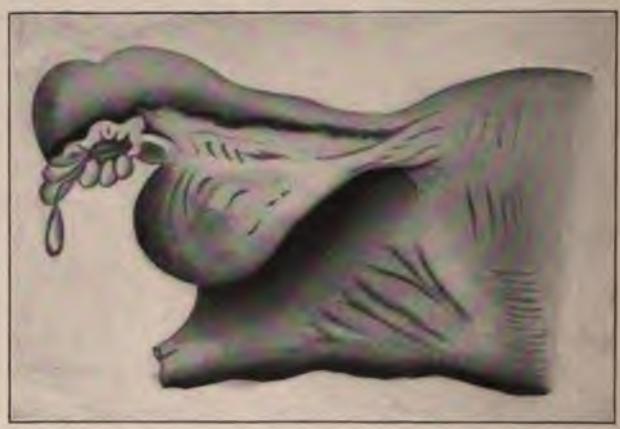
The parovarium is situated between the layers of the broad ligament, below the tube.

The Fallopian Tube.—The Fallopian tube, or oviduct, which may be looked upon as the physiological duct of the ovary, is a long, slender organ, extending outward from the cornu of the uterus, at a point just posterior to the insertion of the round ligament. The tube varies from 7 to 13 cm. in length. It curves outward and then backward, above and in front of the ovary, its outer end lying free in the pelvic cavity. At the uterine end it is from 0.3 to 0.4 cm. in diameter, gradually widening to 1 to 1.5 cm. at the outer extremity.

Various names are given to different portions of the tube. The *uterine portion* is included within the muscular wall of the uterus and extends from the upper corner of its cavity to the straight, narrow segment, next to the uterus, which is called the *isthmus*. Then comes the slightly dilated, sinuous, middle portion, the *ampulla*, which in turn connects with the outer segment, called the *infundibulum* or *fimbriated extremity*. The latter name is derived from the irregular, finger-like processes or *fimbriæ* which surround the opening. One of these, the *fimbria ovarica*, is longer than the others and is frequently attached to the ovary (Fig. 257).

One or more pedunculated vesicles, 0.5 to 1 cm. in diameter, are often found dependent from the fimbriated end of the tube. These are the *hydatids of Morgagni* and have no particular pathological importance.

FIG. 257



The uterine appendages of the left side, seen from behind; natural size; a few of the tubules of the parovarium can be seen in the broad ligament above the ovary. A hydatid of Morgagni is dependent from the fimbriated extremity of the tube.

Throughout its course, except at the uterine portion and at the free extremity, the tube is covered by the middle fold of the broad ligament.

On opening the tube its lumen is found to connect with the cavity of the uterus by a small opening, the *ostium uterinum*, which barely admits a hog bristle. The ovarian end opens directly into the pelvic portion of the peritoneal cavity, through the *ostium abdominale*, so that in the female there is a direct connection between the peritoneal cavity and the external world through the tubes, uterus, and vagina. The lining has the appearance of soft velvet, due to the multiplicity of folds which the mucosa assumes. These folds, primarily but four or five in number, increase in complexity from the uterine to the peritoneal extremity.

Histology.—The tubal wall is made up of three coats, corresponding to and continuous with those of the uterus. Externally there is a

fibrous coat, which is covered by peritoneum and contains the ramifications of the bloodvessels and lymphatics. Next, there is found a coat composed of *smooth muscle* fibres, arranged in three ill-defined layers—outer and inner longitudinal and middle circular. These are most clearly marked at the uterine portion, where they correspond roughly with the different layers making up the musculature of the uterus.

Internally, forming the lining, is a coat of *mucous membrane*, thrown into many long folds, which project into the lumen of the tube and give to a cross-section a very complicated appearance (Fig. 258). These folds are covered with a single layer of high columnar, ciliated, epithelium, resting on a basement membrane. The cilia wave in one direction only and cause a current toward the uterus. Glands do not occur.

The peritoneum covering the tube and the connective tissue forming the outer coat are continuous with the corresponding layers of the broad

FIG. 258

Cross-section of Fallopian tube, showing folds of the mucosa.

ligament, the attached portion forming the *mesosalpinx*. Through this the bloodvessels and lymphatics reach the tube. The arteries are branches of the utero-ovarian anastomosis. The veins empty into those of the broad ligament and the lymphatics drain into the lumbar glands.

The Ovary.—The ovary, located behind and below the tube, varies in size and appearance according to age. In the child it is long and narrow, later becoming of an ovoid shape. In the adult it generally measures from 2.5 to 5 cm. in length, 1.5 to 3 cm. in width, and 0.5 to 1.5 cm. in thickness. Before puberty it is smooth and of a pearly gray color, while in adult life it has a corrugated surface and is of a grayish-white hue. Both the size and the appearance of the normal adult ovary may vary greatly. The same may be said of its position, although it generally lies somewhat obliquely, with its long axis parallel to the

external iliac vessels, in a shallow depression on the obturator muscle, termed the *fossa ovarica*.

It is attached by its straight border to the broad ligament, by the *mesovarium*, while the convex border lies free in the pelvic cavity. The *utero-ovarian ligament*, which is 1.5 to 2 cm. in length and 0.3 to 0.4 cm. in diameter, connects the inner pole to the uterus. Attached to the outer pole and extending to the lateral wall of the pelvis is the suspensory ligament or *infundibulo-pelvic ligament*, being the upper border of the broad ligament external to the tube. In it run the ovarian vessels.

On cross-section of the ovary two ill-defined zones can be made out with the naked eye, the external of which is the *cortex*, and the internal the *medulla*. The former contains, for the most part, the distinctive ovarian structures and becomes thinner with advancing age; the latter is made up of a network of blood-vessels embedded in loose connective tissue (Fig. 259).

FIG. 259

Diagram showing the arrangement of the various zones in the ovary. *A*, germinal epithelium; *B*, tunica albuginea; *C*, zone containing immature Graafian follicles; *D*, zone containing mature follicles; *E*, zone of fine bloodvessels; *F*, zone of connective tissue, vessels and nerves.

Histology.—In carefully prepared sections the ovary is found to be covered by a single layer of flat or cuboidal cells, the *germinal epithelium* of Waldeyer. The cells are directly continuous with those of the peritoneum, the junction of the two at the hilum being clearly marked. In rare cases this germinal epithelium may be ciliated.

Beneath the epithelium there is a firm layer of connective tissue, the so-called *tunica albuginea ovarii*, forming not a true tunic for the ovary, but merely a zone of condensed fibrous tissue, intimately connected with the deeper structures.

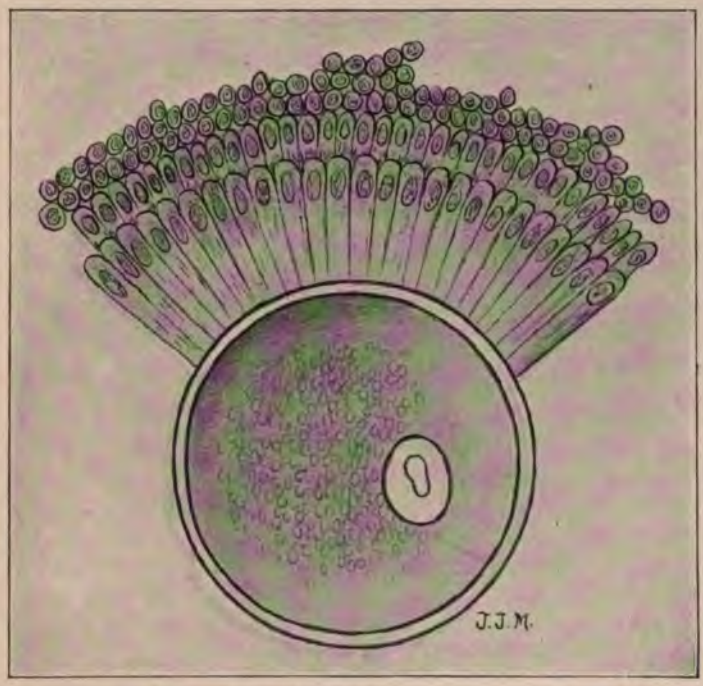
The cortical zone is made up of a stroma of connective tissue, having small spindle-shaped cells embedded in which are the essential ovarian elements, the ovarian or *Graafian follicles*. In the ovary of the child these follicles are very numerous and consist of nests of cells, *primordial follicles*, formed during fetal life by a downgrowth and nipping off of cells from the germinal epithelium. They consist of a single layer of flattened cells, arranged spherically around the ovum—the whole being from 50 to 60 microns in diameter.[1] Their formation ceases at birth. It has been computed that they number, at this time, in both ovaries from 75,000 to 100,000.

At puberty the cells of a few of the more deeply situated follicles begin to proliferate, forming the *Graafian follicles*, first described by

[1] The measurements throughout are expressed in the metric system. If the reader is not accustomed to thinking in these terms it is well to bear in mind that a centimetre is equal to 2/5 of an inch; a millimetre to 1/25 of an inch; a micron is a microscopic measurement and equals 1/1000 of a millimetre.

De Graaf, who believed that they were ova. In this change from the primordial to the Graafian follicle the flattened cells surrounding the ovum assume a cuboidal shape and become more and more numerous. Some of them finally degenerate, aiding in the formation of the *liquor folliculi* and the nest of cells becomes converted into a small cyst. As the fluid accumulates the ovum and the cells immediately surrounding it are pushed to one side, the cyst increasing in size until it reaches a diameter of 1 to 1.5 cm. The follicle gradually pushes its way toward the periphery of the ovary and when mature lies just beneath its surface,

FIG. 260



Ovum and some of the cells of the discus proligerus. (After Nagel.)

a portion projecting as a translucent cyst. At this point, known as the *stigma*, there are few bloodvessels.

In the mature follicle the following structures require description:

Ovum.—The human ovum, discovered by von Baer in 1827, is spherical in shape, and just before its release from the follicle is 0.2 mm. in diameter and just visible to the unaided eye. It is enveloped in a membrane, the *zona pellucida* of von Baer, formerly supposed to be clear and structureless but now known to possess minute striations, which are believed to be pores or *micropyles*. Through these minute openings nutriment is believed to pass and the spermatozoön to penetrate.

The substance of the ovum is made up of a semisolid protoplasm, the *vitellus*, or yolk, in which can be seen minute, highly refractile granules. A large nucleus, the *germinal vesicle*, is situated eccentrically. This nucleus is vesicular, contains a clear substance surrounding threads of karyoplasm and one or more nucleoli. The largest of these nucleoli is the *germinal spot*. Occasionally a single follicle contains two ova (Fig. 260).

Discus Proligerus.—The discus proligerus, or *cumulus oöphorus*, is the name given to the collection of cells immediately surrounding the ovum. These are derived from and are similar to the cells of the *germinal epithelium*.

Membrana Granulosa.—This consists of several layers of cells lining the follicle. They are cuboidal in shape, have a round, deeply staining nucleus and are derived, as we have seen, from the germinal epithelium.[1]

Theca Folliculi.—Outside of the membrana granulosa is the theca folliculi, a connective-tissue membrane, which Henle divides into an external, *tunica fibrosa*, and an internal, *tunica propria*.

Liquor Folliculi.—The liquor folliculi is a thin, watery fluid, probably formed both by a degeneration of the membrana granulosa cells and by a transudation from the bloodvessels.

When ovulation takes place the follicle ruptures and the ovum, surrounded by a few of the cells of the discus proligerus which form a fringe about the ovum, spoken of as the *corona radiata*, is cast off to find its way into the tube or to degenerate in the peritoneal cavity. Until recently the rupture of the follicle was supposed to be in consequence of the increased tension of the accumulated liquor folliculi, but later work has shown that it is not to be thus simply explained. According to Clark, the phenomenon is the result of changes in the circulation. At the menstrual period, which is synchronous with that of ovulation, the ovary is congested and the increase in the blood supply causes tension on the follicle. At the thinnest portion of the follicular wall—*i. e.*, at the *stigma*, the circulation is impaired, causing necrosis and rupture.

We have now to consider what becomes of the ruptured follicle.

Corpus Luteum.—After the rupture of the follicle and the discharge of the ovum the corpus luteum is formed. The formation of this body is, as Williams says, to be looked upon as nature's method of preventing the ovary from becoming converted into dense fibrous tissue, which would be the case were the damage caused by the rupture of a follicle to be repaired, as are injuries in other parts of the body.

From the lacerated bloodvessels the cavity of the follicle is filled with blood and into this grow festoons of proliferating cells, now generally believed to be derived from the internal layer of the theca folliculi.

[1] Foulis held that the cells of the membrana granulosa are derived from the connective tissue of the ovary and the more recent work of Clark and Wendler seems to support this view. The generally accepted theory, however, is that they are derived from the germinal epithelium.

These cells are the *lutean cells* and give to the corpus its characteristic yellow color, from which it derives its name. Connective tissue, from the ovarian stroma, follows into these festoons of lutean cells; the follicular walls contract; the blood clot disappears by phagocytosis; part of the lutean cells are absorbed and part undergo hyaline degeneration—a series of changes which bring about the formation of the *corpus fibrosum*, or *corpus albicans*. This in turn undergoes further changes. The connective tissue contracts and in some unknown way the hyaline matter disappears, there remaining only a small scar.

The corpus luteum is always larger than the mature follicle from which it forms, and may be 2 to 2½ cm. in diameter.

It was formerly supposed that the corpus luteum formed only during pregnancy; later it was believed that there is a difference between that of pregnancy, the *corpus luteum verum*, and that of menstruation, the *corpus luteum spurium*.[1] We now know that they are the same, varying only in size.

Only a small number of the primordial follicles ever reach maturity. The remainder develop for a time when the cells of the membrana granulosa undergo degeneration and, with the liquor folliculi, are absorbed, a minute amount of connective tissue taking its place. Thus, as age advances the ovary becomes denser and more scarred and corrugated, fewer and fewer follicles being seen on cross-section.

The *medullary portion* of the ovary is made up of connective tissue, ramifying in which are numerous arteries, veins, nerves, and lymphatics. The latter drain into the lumbar glands. Some observers claim that there are muscle fibres in the stroma and that they are concerned in the rupture of the follicles, but this observation has not been confirmed. Remains of the Wolffian body, termed *medullary cords*, may sometimes be found in the hilum.

The Parovarium.—If the portion of the broad ligament, between the tube and the ovary, be stretched between the fingers and held so that the light will shine through, a number (7 to 10) of opaque lines about one millimetre in diameter will be seen running at right angles to the tube and converging slightly toward the ovary, where they end abruptly. Above, just beneath the lower border of the tube, they connect with a longitudinal line which extends toward the uterus but suddenly ends when several centimetres from it.

On microscopic examination these lines are found to be tubules, lined by a single layer of high columnar epithelium.

Taken together they form the *parovarium* of Kobelt, or the *organ of Rosenmüller*, sometimes also spoken of as the *epoöphoron* of Waldeyer. They are the remnants of the tubules of the Wolffian body and correspond to the epididymis in the male. They are of practical interest, as they may be the starting point of new-growths.

Bloodvessels, Lymphatics, Nerves.—The blood supply of the ovary is derived, for the most part, from the ovarian artery, but to some extent

[1] The term corpus luteum spurium is at times applied to a formation somewhat similar to the corpus luteum, which is sometimes formed as the result of the degeneration of immature follicles.

also from the uterine. The ovarian artery arises from the abdominal aorta at a point just below the origin of the renal arteries. It runs downward and somewhat outward, lying on the psoas muscle, beneath the peritoneum, crosses obliquely over the ureter, reaches the pelvic wall, and then turning inward enters the folds of the broad ligament through the infundibulopelvic ligament. At the mesovarium from six to eight spiral branches are given off, while the terminal branches freely anastomose with the uterine artery.

The veins form at the hilum the so-called *plexus ovaricus*, emptying in part into the uterine veins and in part through the *plexus pampiniformis* into the ovarian veins. The right ovarian vein empties into the inferior vena cava, while the left empties into the left renal vein. This difference in the arrangement of the two sides is thought by some to be the explanation of the more frequent occurrence of ovarian pain on the left side.

The ovary has an abundant supply of lymph vessels. These begin around the follicles, converge to the hilum, whence they follow the general course of the bloodvessels.

They drain into the lumbar glands, located just below the kidneys, in front of the aorta and vena cava.

The nerves, derived from the sympathetic system, spring from the spermatic, renal, and superior mesenteric ganglia.

DISEASES OF THE FALLOPIAN TUBE (EXCLUSIVE OF INFECTIONS AND EXTRAUTERINE PREGNANCY).

Anomalies.—Anomalies of the tube are not frequent. When the Müllerian duct fails to form on one side the tube is absent, or if the duct does not properly develop and remains impervious, the tube is represented by a fibrous cord. As the tubes and the uterus have a common origin, the tubes are lacking when the uterus is congenitally absent. In the case of a bicornuate uterus the tubes are normal, inasmuch as the malformation is caused by disturbances in the development of the Müllerian ducts at a point below the portion forming the tubes.

FIG. 261

Accessory tube. (After Gebhard.)

Accessory Tube. — Accessory tubes are occasionally seen and are usually little outgrowths from the main tube, ending either blindly or having a poorly defined fimbriated extremity. These are of little importance except as the possible starting point of a tubal pregnancy.

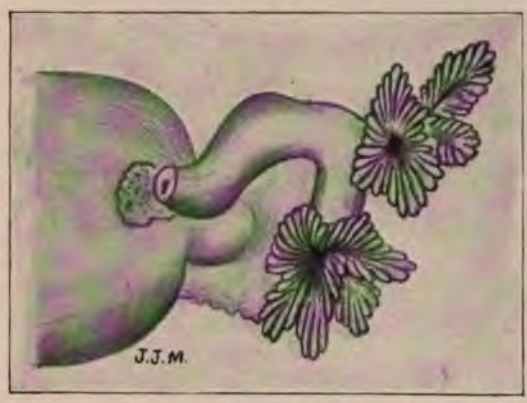
Accessory Ostia.—These are somewhat more frequent than complete reduplication of the tube, but they are of but little importance.

Displacements.—The tube and the ovary being intimately connected, displacements of the one cause malpositions of the other. They will be discussed in connection with the ovary.

Neoplasms.—True new-growths of the tube occur but seldom. Of the connective-tissue tumors a few cases of *myoma* and *fibroma* have been reported. These exist as small out-growths from the tubal wall, and as they seldom attain a size larger than a hazel-nut or hickory-nut, they produce no symptoms and require no treatment. Fehling, however, has operated upon a large degenerated fibroma and von Recklinghausen has reported a case of adenomyoma of considerable size but differing in no respect from similar tumors of the uterus.

Sarcoma.—According to Döderlein there have been but five cases of sarcoma of the tube reported, in four cases developing from the stroma of the submucosa and in one from the connective tissue of the fibrous

FIG. 262



Accessory fimbriæ. (After Gebhard.)

coat. In these cases the tube was sausage-shaped and filled with soft masses appearing like bone-marrow. Microscopically, there may be the usual varieties of sarcoma—the round, spindle, and mixed-cell types.

Epithelial tumors, though rare, are somewhat more common than those of mesoblastic origin. They are either papilloma or carcinoma.

Papilloma.—Papilloma is a somewhat rarer condition than has been supposed, for a number of the reported cases on receiving more careful study have been placed in the list of carcinomata. They form sausage-shaped tumors, freely movable, and not to be distinguished either clinically or macroscopically from the carcinomata. Only by the microscope can the differentiation be made. True papillomata are rare. In 1898 Clarke could find but seven authentic cases.

Carcinoma.—Cancer of the tube may be either primary or secondary. When of secondary origin the mother tumor is usually located in the ovary or uterus. Of cancers, primary in the mucosa of the tube, Hurdon has

collected thirty-five instances from the literature. I have had one case, which has not been reported.

In a large majority of instances the disease appears in the fifth and sixth decades; the youngest case in Hurdon's list was thirty-five and the oldest seventy (Figs. 263, 264, and 265).

Symptoms.—An almost constant symptom is the existence of a serosanguineous discharge, which is generally very offensive and very irritating. In five of Hurdon's cases there was metrorrhagia and in two others a profuse menorrhagia. Pain is frequently present, occurring generally after the onset of the discharge, at times, however, being present before the discharge is noticed. In some cases, notably those of

FIG. 263

Primary carcinoma of the tube. (Natural size.) *a* is the proximal end of the tube and *b* the occluded fimbriated extremity. Near the uterus the tube is nearly normal in size, but rapidly enlarges until near the fimbriated extremity, it is 3 cm. in diameter. At *e* are two subperitoneal cysts. The ovary, *c*, contains a small cyst with dark-colored walls. Attached to the under surface of the ovary are several adhesions. (Hurdon.)

Roberts and Routier, there were severe attacks of pain followed by a profuse watery discharge, after which the pain would subside. Ascites is sometimes associated. Sterility is noted in most cases, but on account of the advanced age at which the majority of these cases occur it is an unimportant symptom.

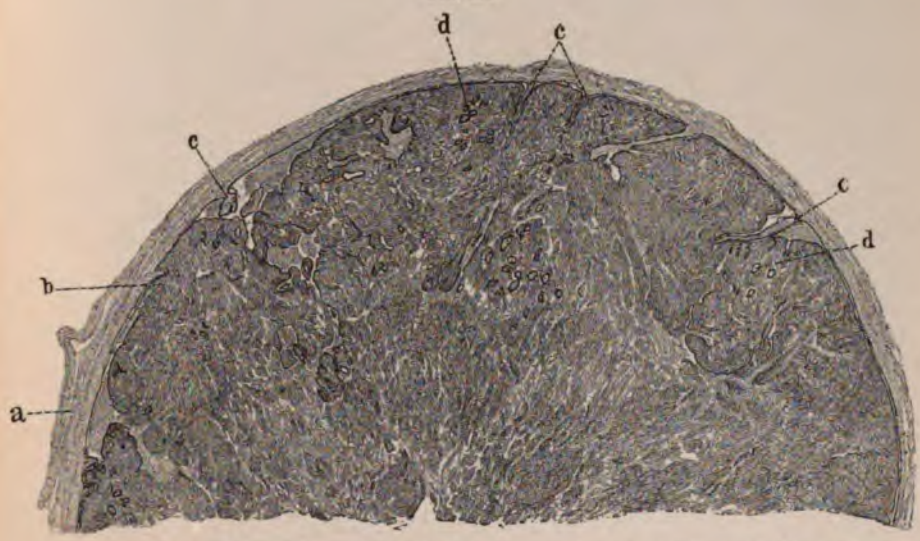
The history of my own case was quite characteristic. The patient was a woman aged fifty-three years, who had borne two children in early life, the youngest aged twenty-four years. When fifty years old she passed through the menopause without mishap. For two years before coming under observation she had suffered with pain in the left side; for three months this had been very severe and she had noticed

considerable tenderness in the same region. During these three months there had been a profuse, offensive, and irritating discharge.

Diagnosis.—More than a probable diagnosis cannot be made, but the finding of a soft, sausage-shaped tumor in one or the other fornix or in the cul-de-sac, behind the uterus, in a patient who is beyond the childbearing age, and who gives no history pointing to a recent infection, would lead one to suspect a new-growth of the tube or of the ovary. If the ovary can be palpated, distinct from the mass, a probable diagnosis of carcinoma of the tube can be made.

Histologically, carcinoma is to be distinguished from papilloma. In the former the epithelial cells lining the folds of mucous membrane

FIG. 264



Transverse section through upper half of the carcinomatous tube. (6 diameters.) The tube is fully five times its normal size. The wall, as represented by *a*, apart from being somewhat thinned out, is unaltered; *b* indicates the inner lining composed of one layer of cylindrical epithelium, in places somewhat flattened. The remnants of the bases of the folds are indicated by *c c*. The lumen of the tube as indicated by the dark shade is completely filled with epithelial cells of the new-growth. In many places these form a homogeneous mass, but at the points indicated by *d d* assume a glandular arrangement. (Hurdon.)

become polymorphous, several layers in thickness, and have a tendency to invade the surrounding and underlying tissue. Every epithelial new-growth, though apparently non-malignant, should be regarded with suspicion.

Treatment.—The abundant lymphatic supply of the tube tends to cause early metastases. The thin walls of the tube also favor rapid extension so that the treatment, which is always operative, should be radical. In 25 per cent. of the cases the opposite tube is also involved, therefore all the pelvic organs should be removed.

FIG. 265

Adenocarcinoma of the Fallopian tube. (80 diameters.) The section is taken from the wall of the tube. *a* is the somewhat flattened but normal tubal epithelium; *b*, a cross-section of a normal fold and *c* the lining of a portion of a diverticulum from the lumen. Penetrating the wall of the tube and occupying nearly half of the field is carcinomatous tissue. The cells on the whole have fairly uniform nuclei, but here and there they are deeply stained and increased in size. At several points, especially in areas indicated by *d*, a distinct gland-like arrangement is demonstrable. Along the advancing margin of the growth there is considerable round-cell infiltration, especially evident at *s*. (Hurdon.)

According to Hurdon the prognosis is less favorable than in carcinoma of the uterine fundus, but the number of cases which have been carefully reported is too small to allow of any trustworthy deductions. The writer's patient remains well, twenty months after the operation.

The little cysts—hydatids of Morgagni—formed from the upper end of the Müllerian duct, are sometimes considered as new-growths. This is an error, as they are sufficiently common to be considered as normally present.

CHAPTER XXII.

DISEASES OF THE OVARY (EXCLUSIVE OF INFECTIONS).

By BENJAMIN R. SCHENCK, A.B., M.D.

The recognition of the finer alterations in position, size, and shape of the ovaries is dependent upon the skill of the examiner. It is most important that correct methods of palpation be practised from the beginning. If these be faithfully carried out one soon becomes able to detect, in favorable cases, very slight abnormalities. Nowhere have these methods been more concisely and clearly described than in an article on the palpation of the ovaries written by Kelly, and the following points are taken almost verbatim from it:

The Simple Bimanual Palpation.—This depends for its success upon the deep displacement of a part of the abdominal wall in a direction downward through the superior strait into the pelvis. The pressure must be made on the part of the wall directly overlying the ovary, called the "ovarian region," and continued downward, inward, and forward. The external hand thus employed does not feel the ovary; it does nothing more than to supply a plane of resistance, preventing the upward displacement and gliding away of the ovary when touched by the vaginal finger, which is introduced up to the fornix of the vagina of the same side.

Two acts of the vaginal hand now bring the ovary within reach of the finger; by one of them the fornix is displaced upward and outward from 2 to 4 cm.; by the other the perineum and vaginal outlet are invaginated up into the pelvis from 4 to 6 or more cm. This is most important. The pushing must be entirely from the elbow, while the wrist and the hand remain perfectly flexible.

The rectal examination should next be made. The well-oiled index finger is introduced through the anus and carried up behind the uterus, invaginating the pelvic floor as previously described until the finger attains the upper third of the pelvis. There is usually some difficulty in finding the passage way behind the cervix at the "third sphincter," on account of the number of lax folds just below this point. The opening above is small and it must be gently sought. When it is found the finger slips upward into an apparently free space without limit above. By this means the whole of the posterior surface of the uterus and the broad ligament is exposed to touch.

If a satisfactory examination is not obtained by these manœuvres a different use may be made of the external hand. The uterus may be pushed back into an artificial retroposition, by this means bringing the

body, with the lateral structures, within easy reach. This is accomplished by catching the uterus with the abdominal hand and pushing it backward, at the same time pushing the cervix upward and toward the symphysis. If now, with the uterus thus artificially displaced, we introduce the examining finger high up into the rectum in the manner already described, while continuing the downward pressure from above, all the pelvic organs may generally be palpated with great accuracy.

If the ovary cannot now be recognized it may be traced by means of the utero-ovarian ligament. This will be felt as a well-defined prominent band on the posterior surface of the broad ligament near the fundus uteri. The quickest way to find this ligament is to run the finger, beginning at the cornu uteri, down the side of the uterus at its broad ligament attachment. Two prominent folds are thus discovered and the upper one, about one-fourth the way down, is the utero-ovarian ligament. Taking this as a leader and following it out from the uterus from 1½ to 2½ cm., a hard body will be felt, which is always the ovary.

The Trimanual Palpation.—If now there is any doubt as to the exact condition of the ovaries the so-called trimanual examination should be made. It is conducted in the following manner:

Catching the anterior lip of the cervix with a pair of bullet forceps, it is drawn slowly down without resistance toward the vaginal outlet. An assistant takes the forceps, holding the uterus just at or a little above the outlet, while a bimanual examination is made through the rectum and abdominal walls. The facility with which the ovaries can thus be reached is even greater than by the preceding methods.

In place of the bullet forceps Kelly's tenaculum, having a corrugated handle, may be used. It is grasped in the pelvic hand between the ball of the thumb and the last phalanges of the second and third or third and fourth fingers, or in the rectal examination it may simply be held between the dorsal surface of the third and the palmar surface of the fourth finger. This leaves the index finger of the same hand perfectly free to make the examination with the usual assistance of the abdominal hand above.

Anomalies.—Complete *absence* of the ovaries occurs only when there is congenital absence of the other pelvic organs. When absent on one side there is also absence of the tube and the corresponding half of the uterus—uterus unicornis. Both of these anomalies are rare.

In case of infantile uterus the ovaries are usually small and but partially developed, containing at times Graafian follicles, at other times none.

Amenorrhœa or severe dysmenorrhœa may result.

Supernumerary Ovaries.—Supernumerary ovaries may sometimes be found, but are seldom larger than a pea or a small bean. Whether these are ever formed from an accessory keimdrüse is very doubtful, most of them probably originating from a portion of the ovary separated either by inflammatory bands or by disturbances in the development of the blood supply in the mesovarium.

Malpositions.—Alterations in the position of the ovaries is frequent as a complication of tumors in the neighboring organs, or as a result of infection and peritoneal adhesions. In either case the position of the ovary is of secondary importance. Certain malpositions, however, occur which are of importance in themselves.

An abnormally high position in the lumbar region may be found, due to a failure of the ovary to descend. An undescended ovary on the left side may be buried beneath the sigmoid flexure.

The ovary and tube may be found in a hernial sac, although such instances are not common. Of these herniæ the inguinal are the most frequent. While they may be unilateral and acquired they are more frequently bilateral and congenital; defects in the development of the round ligament being usually associated. On examination of the inguinal region, a firm, round body is felt, often difficult to distinguish from a lymph gland. There may be no symptoms until puberty, when the onset of menstruation with the consequent hyperæmia and increased pressure usually causes much pain. In making a diagnosis the possibility of confusion with enlarged lymphatic glands, hydrocele of the canal, myoma of the round ligament, and fibroma of the neighboring fascia must be borne in mind. The acquired form may be reduced by manipulation, but the congenital variety is irreducible and should be treated by radical operation, care being taken to preserve the blood supply of the ovary, which should not be removed but carefully replaced and the defect in the abdominal wall repaired in the manner preferred by the operator as in ordinary inguinal hernia.

Crural, obturator, and ventral herniæ may occur, but are rare.

Degeneration, cystic or malignant, of an ovary, displaced without the pelvis, is common, a point to be borne in mind in advising non-operative treatment.

Descensus of the Ovary.—The ovary being in intimate relation with the uterus, malpositions of the latter are always accompanied in a certain degree by displacements of the former and should be considered in connection with displacements of the uterus. When, however, the uterus is in proper position, we may have an independent prolapsus of the ovary. Sänger has distinguished two varieties of descensus:

1. Descensus lateralis, or the falling of the ovary to the outer side of the uterosacral ligament.

2. Descensus posticus, the displacement into Douglas' cul-de-sac, often termed prolapsus ovarii.

The first variety is frequent; the second is more rarely seen. As no sharp distinction can be drawn between them they will be considered together.

The cause may be either an increase in the size and weight of the organ, produced by hyperæmia, hypertrophy, etc., or by the presence of abnormally long ovarian ligaments, most frequently found in connection with subinvolution of the uterus. Sudden falls may sometimes be a cause. The left ovary is more frequently out of place than the right, probably because of the presence of the sigmoid flexure on that side.

In 77 cases, Mundé found the left descended 46 times, the right 19 times, and both 12 times.

Symptoms.—When the ovary, always a sensitive organ, is crowded down to the floor of the pelvis, every increase in intra-abdominal pressure will cause pain. A loaded rectum may press on the ovary and coitus is nearly always painful. This continued irritation brings about pathological changes in the organ, resulting in œdema, hyperæmia with hæmatoma of the Graafian follicles, connective-tissue hyperplasia with follicular degeneration, ending, as was first pointed out by Sänger in perioöphoritis and dense peritoneal adhesions.

Diagnosis.—The diagnosis is readily made by careful bimanual examination, an anæsthetic sometimes being necessary.

Treatment.—If the descensus is associated with displacement of the uterus, and the ovary is not bound down by adhesions, the malposition may be remedied by a well-fitting pessary. The use of supports, however, is especially difficult on account of the presence of the sensitive ovary. When, on the other hand, the descensus of the ovary is independent of the position of the uterus, or there are adhesions too dense to be separated by manipulation, the treatment is surgical. The infundibulopelvic or the utero-ovarian ligament may be shortened or the ovary fixed to the posterior surface of the broad ligament. If the ovary is badly diseased and the pathological condition so advanced as to preclude restoration to the normal, the ovary must be removed.

Hyperæmia of the Ovary.—The ovaries, in common with the other pelvic organs, being subject to a periodic increase in the blood supply at the menstrual periods and less frequently during pregnancy, disturbances in the circulation are readily and frequently produced. Passive congestion is the first of the alterations resulting from prolapsus, and active hyperæmia the first stage of acute oöphoritis. As in the case of the uterus, it is difficult to distinguish between simple hyperæmia and acute inflammation.

Hyperæmia is most frequently seen in women of neurotic tendency, the onset of menstruation being usually early and the menopause late in life. It may be produced by excessive coition or masturbation, and is sometimes seen in the course of the acute infectious diseases, such as typhoid fever, scarlet fever, diphtheria, etc.

When the congestion is severe or long-continued, alterations occur in the structure of the ovary. Hemorrhage may take place either diffusely throughout the stroma or in circumscribed spots, occurring particularly from the vessels surrounding the Graafian follicle, thus producing the so-called follicular hemorrhage. By the confluence of two or more of these follicles the *hæmatoma ovarii* is produced, but this is rarely larger than a hazel-nut.

A large percentage of these cases of "apoplexy of the ovary" end in absorption of the blood and organization of the remaining tissue.

Symptoms.—Often ovarian hemorrhage of this kind produces no symptoms. Congestive dysmenorrhœa and menorrhagia may occur. If the tumor formed is large, pressure symptoms may result.

The diagnosis is made from the history of painful menstruation and excessive flowing unaccompanied by fever, together with an increase in the size of the ovaries, as palpated bimanually.

Treatment.—Rest in bed, sedatives, the application of an ice-bag or turpentine stupe to the lower abdomen, and copious hot vaginal douches are the principal measures to be employed.

In connection with ovarian congestion we have to consider the dilatation of the veins in the broad ligament—the varicocele of Dudley. One not infrequently sees cases presenting dull aching pain, usually on the left side, low down in the ovarian region, which result from a varix of the veins in the broad ligament, the discomfort entirely disappearing after ligation or excision of these veins.

Atrophy, hypertrophy, and hyperplasia of the ovaries occur, for the most part, as the result of oöphoritis and are considered in the section on Inflammation of the Ovaries.

Neoplasms of the Ovary.—In no other organ of the human body does such a great variety of new-growths develop as in the ovary. It is difficult, as Kelly says, to disassociate mentally the great physiological activity of the ovary from its pathological activity, once its cells become perverted.

Classification.—Numerous classifications of ovarian tumors have been made. The best division, considered from the standpoint of the pathologist, is that of Pfannenstiel, who classifies them as follows:

A. Developing from the parenchyma.
   1. From epithelium.
      a. Cystoma.
      b. Adenoma.
      c. Carcinoma.
   2. From ovum.
      a. Dermoid tumors.
      b. Teratoma.

B. Developing from the stroma.
   1. From connective tissue
      a. Fibroma.
      b. Sarcoma.
   2. From vessels.
      a. Endothelioma.
      b. Angioma.

The classification adopted by Kelly preserves the pathological and to some extent the embryological distinctions, and at the same time is more convenient for the clinician. With some minor alterations it will be here followed. We divide, then, ovarian tumors into three main groups, each with three subdivisions, as follows:

A. Retention Cysts: While not strictly new-growths, cysts formed by the retention of fluid in the normal cavities of the ovary produce tumors, and hence for convenience may be considered here. They comprise:

1. Multiple cystic follicles.
2. Graafian follicle cysts.
3. Corpus luteum cysts.

B. Tumors developing from the epithelial structures of the ovary, divided into:

1. Cystadenoma, the classical ovarian tumor, often reaching very large size.
2. Papilloma.
3. Carcinoma.

C. Tumors developing from the mesoblastic or connective-tissue cells of the ovary, divided into:

1. Fibroma.
2. Sarcoma.
3. Myoma.

D. Dermoid cysts.

E. Tubo-ovarian cysts.

F. Parovarian cysts.

While not strictly ovarian cysts, the tumors of the parovarium are so intimately connected with them that it is convenient to here classify them.

Although these tumors differ greatly in their structure, and, to a less extent, in their clinical signs and symptoms, there are certain conditions and characteristics which are common to all, and these will be taken up before describing in detail the separate growths.

Gross Structure.—Tumors of the ovary may be solid or cystic. The latter are the more common and comprise the neoplasms of the first group, or retention cysts, the cystadenomata, the papillomata, dermoid and parovarian cysts. Carcinomata may be either solid or cystic, more frequently cystic, with thick walls and attached solid bosses. Fibromata, sarcomata, and myomata form solid tumors, unless degeneration has taken place, in which case cysts of varying size may be found in the interior.

Relative Frequency.—The statistics from the different clinics of the relative frequency of the various tumors differ slightly, but the table of 200 cases, given some years ago by Olshausen, may be taken as a fair average. His figures are as follows:

Cystadenomata	151
Carcinomata	4
Fibromata	5
Sarcomata	5
Dermoids	8
Tubo-ovarian cysts	3
Parovarian cysts	24

The cystadenomata and papillomata are here grouped together and comprise about 75 per cent. of all cases.

The benign cystadenoma is by far the most frequent of all ovarian neoplasms, forming 62 per cent. of the cases in the table given by Leopold; 59 per cent. in that of Martin and 52 per cent. in that of Schauta.

Of fibromata, Heine found 10 cases in a list of 727 tumors (1.3 per cent.) and Martin 10 in 527 cases (1.8 per cent.). Pfannenstiel gives 2 to 3 per cent. as the usual occurrence.

Of malignant neoplasms, including both carcinomata and sarcomata, Schroeder found 16.4 per cent. in 600 cases; Martin 18 per cent. in 236 cases, and von Winckel 21 per cent. in 296 cases. Of these carcinomata comprise from 75 to 85 per cent., the average of sixteen authors, given by Tarnowski, being 77.7 per cent.

General Characteristics.—In shape the smaller neoplasms conform more or less to that of the ovary, while the larger are spherical. As a general rule, the larger the tumor the more nearly spherical it is, or in the case of multilocular cysts, the more nearly spherical are the individual loculi.

In size they vary greatly. The retention cysts are small; the cystadenomata very varying but usually of considerable size, unless early removed; the solid tumors rarely occur larger than a fetal head.

The color of the cystic tumors depends upon the character of the contents and the thickness of the wall. Usually they are bluish white and opalescent, but may be of a green, yellow, or gray hue. The solid tumors having, as a rule, a scant blood supply, are yellow or yellowish white and are often mottled on the surface, due to areas of degeneration.

Manner of Attachment.—The tumors of the first group are intimately attached to the ovary, usually by a broad base, the multiple cystic follicles being found over the surface of the whole ovary, while the cysts of the Graafian follicles and of the corpora lutea are intimately attached to the ovary over a wide area. The tumors of the second and third groups may be either pedunculated or may develop within the folds of the broad ligament—*i. e.*, may be intraligamentary. When pedunculated the pedicle is formed by the drawn-out hypertrophied ligaments of the ovary, the tube and the round ligament of the uterus. The pedicle may be narrow or broad (2 to 15 cm.), short or long (5 to 20 cm.). On cross-section of the pedicle one can usually recognize the tubal lumen, the solid round ligament, often with a moderately large bloodvessel in its centre, the cross-section of the ovarian artery with one or more accompanying veins, representing the infundibulopelvic ligament, and the utero-ovarian ligament.

If the tumor develops from the posterior, free margin of the ovary, the pedicle is usually long and narrow, while one starting near the hilum will usually present a short, broad pedicle. All possible variations are to be seen. Occasionally a double pedicle is met with, due to a secondary splitting of a single stem.

Intraligamentary tumors are formed by the development within the folds of the broad ligament. They lie low in the pelvis, are not very movable, and on opening the abdomen may be at once recognized by the double set of bloodvessels running over the surface, one set corresponding to the peritoneal leaf, the other to the vessels of the tumor wall.

Age of the Patients.—While new-growths of the ovary may appear at any age, they most frequently develop during the time of the physiological activity of the ovary. Of 257 cases at the Jena clinic, 188 appeared between the ages of twenty and fifty. Expressed in decades, the figures were as follows:

PLATE XL.

Enormous Ovarian Cyst, with Pendulous Abdomen and Characteristic Emaciation. (Dudley.)

Before 20	10
" 20 to 30	65
" 30 " 40	65
" 40 " 50	58
" 50 " 60	47
" 60 " 70	12

Of the 10 which appeared before the twentieth year, 5 were malignant, and of the 59 found after the fiftieth year, 20 were malignant. As a rule, therefore, those growths developing before puberty and after the menopause must be looked upon with suspicion, while those, especially the cysts, developing during active sexual life are usually benign.

Symptoms.—The symptoms of ovarian neoplasm vary greatly. At the beginning there are frequently no symptoms whatever, and the first indication which the patient has that there is anything abnormal is when the swelling of the abdomen is first noticed. It is a common experience in obtaining the history of one of these cases to be told, by the patient, that she first noticed that her skirt bands were becoming tight.

If, however, the tumor develops low down and does not escape from the true pelvis but becomes wedged between the rectum and the uterus,

FIG. 266

Large ovarian cyst.

or to one side of the latter, pressure symptoms may be caused by moderately small growths. There may be merely a sense of weight in the pelvis or more urgent symptoms, due to pressure on the bladder, rectum, or nerve trunks of the sacral plexus. Irritability of the bladder, with frequent but painless micturition, is not an unusual complaint, and retention of urine, due to pressure on the neck of the bladder, is sometimes seen. Disturbances of defecation are more rare. Backache, low down in the sacral region, is often mentioned by the patients and may be the sole reason for the consultation. Pain along the course of the sciatic nerve may be met with. These pressure symptoms are especially frequent in the cases of intraligamentary cysts and in those complicated by adhesions.

Sometimes women with moderately large abdominal tumors will state that they suffered in this manner before the abdominal enlargement began, but that they were relieved when the swelling appeared.

Menstruation may be regular and painless. At times there is some dysmenorrhœa, with either a scanty or a profuse flow. When both ovaries are affected there is usually amenorrhœa.

As the abdominal enlargement increases there may be digestive disturbances, and if it is sufficient to interfere with the diaphragm, dyspnœa may be troublesome. Swelling of the ankles and legs is a frequent complaint and may reach an extreme grade.

In advanced cases the general health is often wretched. Extreme emaciation and weakness may result. The suffering and wasting produce a more or less characteristic facial expression—the facies ovariana (Figs. 266 and 267). Sometimes there is an accompanying swelling of the breasts with the appearance of colostrum.

Fig. 267

Large ovarian cyst.

Diagnosis.—While a careful history of each case is most important, a diagnosis of ovarian new-growth can only be made by the most thorough and painstaking examination.

As the points in the abdominal and vaginal examination differ, according to the size of the tumor, it is convenient to divide them as does Gebhard, into small, medium, and large. Special points in the diagnosis will be given when the various tumors are described in detail.

Tumors of Small Size.—Tumors which are small enough to be contained within the true pelvis and cannot be felt through the abdominal wall must be reached by means of bimanual palpation. The various steps employed in making a pelvic examination must be systematically carried out.

After noting any abnormalities of the external genitalia, the cervix uteri is sought in the median line of the pelvis and with the finger posterior to the cervix and the fundus depressed by the abdominal hand, the size, shape, and motility of the uterus are made out. Most frequently when a small ovarian tumor is present the fundus will be found pushed to the right or to the left side, while the fornix of the opposite side is encroached upon by an ovoid, uniform swelling. It is well to now introduce two fingers into the vagina, if possible to do so without rupturing the hymen. By turning the balls of the fingers upward and

outward and by making counterpressure from above a spherical or ovoid body will be brought between the fingers of the two hands, and on studying its characteristics it will be found to be sharply circumscribed, smooth, somewhat movable, non-sensitive, and of a varying consistency. Usually fluctuation can be made out, but when very tense, or when the walls are thick, the swelling may give the impression of solidity.

The absolute diagnosis rests upon thus feeling upon one side a body distinct from the uterus, absence of the ovary upon the corresponding side and the palpation of the ovary of the opposite side. Frequently it is impossible to absolutely separate the tumor from the fundus uteri, in which case the detection of a distinct groove above and below, between the two bodies, will furnish a probable diagnosis. When intraligamentary the line of demarcation between the new-growth and the uterus may be very difficult to make.

At times an ovarian neoplasm will be found lying in the cul-de-sac, behind the uterus. The latter is then pushed forward and upward, the cervix lying high in the vagina, close behind the symphysis pubis.

One should never begin a pelvic examination without bearing in mind two most important physiological tumors of the pelvis, namely, pregnancy and a distended bladder. If these be not constantly kept in mind an error will sooner or later be made. To thoughtlessly pronounce an early pregnancy an ovarian growth, or to diagnose a distended bladder as a cystic neoplasm is an inexcusable, although more or less common, error. It is not always easy to differentiate an atypical pregnancy, but one should always make it a rule to suspect pregnancy in every case and exclude it as definitely as possible. A second rule to be always followed is to make certain, before beginning the examination, that the bladder is empty.

DIFFERENTIAL DIAGNOSIS. *From Myoma Uteri.*—Ovarian tumors may be confounded with spherical or oval fibroids of the uterus. The points to be noted are the consistency, the attachment to the uterus and the presence of both or the absence of one ovary. The consistency of the tumor may give a clue, for small fibroids are seldom cystic. On the other hand, small ovarian tumors may be solid or so tensely filled with fluid that they are very firm. The palpation of the pedicle gives most valuable evidence, and if this can be made out, as a thin band extending from the tumor to the cornu of the uterus, the diagnosis of ovarian tumor is certain. If attached to the uterus elsewhere than at the cornu a pedunculated myoma is probable. The method of palpating for the pedicle will later be described. In cases of doubt the uterine sound, introduced under the most aseptic precautions, should be employed. If the uterine cavity is longer than normal, a myoma is probable.

From Hydrosalpinx.—Distention of the tube with fluid produces an elongate tumor having the smaller end attached to the uterus. Moreover, it is softer and more definitely fluctuant than is usually the case in the smaller ovarian tumors. Its relation to the ovary of the corresponding side may also serve to differentiate this condition.

From Inflammatory Disease.—The history of a previous infection, with fever, chills, and leucorrhœa, will give a clue in cases of gonorrhœal and puerperal infection. In cases of tuberculosis, however, it is seldom that such a history can be obtained.

On palpation an inflammatory tumor is less definite and less regular in outline. It is frequently bilateral and either intimately bound to the uterus or attached to it over a comparatively broad surface. The swelling is thickened, indurated, and tender on pressure, especially in the streptococcic, puerperal variety. On attempting to move the uterus there is frequently much pain, and if movable at all the tumor masses also move.

The greatest difficulty, in this connection, is to differentiate a dermoid cyst and a tuberculous abscess of the tube and ovary. Both may produce the same symptoms, and both may be located low down in the pelvis. When the tuberculous infection is unaccompanied by evidences of the disease elsewhere, the diagnosis may be quite impossible.

An ovarian tumor, situated behind the uterus, is to be diagnosed from a pelvic abscess. The history of infection, the induration and fixity of the mass, the tenderness on palpation, and the presence of a leukocytosis are the important points to be considered.

From Hæmatocele.—Pelvic hæmatocele being the result in practically all cases, of a ruptured extrauterine pregnancy, a careful history will be of much value. While an hæmatocele may be fluctuant, there is often a difference in consistency in the different parts, seldom noticed in ovarian tumors of small size. Collections of blood are usually found in the middle line, behind the uterus, and are immovable, non-sensitive, as a rule, less circumscribed, and have a less definite extension above.

Tumors of Moderate Size.—By tumors of moderate size we are to understand those about the size of an adult head, which fill the pelvis and extend upward into the lower part of the abdominal cavity. With the patient lying on her back a symmetrical, ovoid swelling is seen elevating the lower part of the anterior wall and showing, if the abdominal walls are not too thick, a definite upper limit. Respiratory movements are limited to the part of the wall above the tumor, being absent over it. As it were, the tumor splints the wall, so that a definite limit can be seen, sometimes called the "breathing line."

On palpation the tumor is more or less regular in outline, but distinct bosses may be felt over the surface. It is definitely circumscribed and usually fairly movable from side to side. If the pelvic portion is not wedged in or adherent there may be considerable mobility upward. Fluctuation will depend upon the number of cysts making up the tumor, and, therefore, may or may not be present. Palpation is usually painless.

On percussion the tumor is found to be flat and to be surrounded by an area of resonance.

A certain diagnosis can be made by combining abdominal and vaginal palpation. After carefully cleaning the vagina, the cervix is seized in a bullet forceps and with the index finger of the left hand high in the

rectum the uterus is pulled down and held by an assistant, who grasps the forceps in his left hand and with the right pushes up the tumor, giving as much space as possible between the symphysis pubis and the growth. The examining finger now outlines the uterus distinct from the tumor and the attempt is made to find the pedicle of the latter. This is to be felt for by beginning at the right cornu and palpating outward toward the pelvic wall. If no band of tissue is encountered the same manipulation is carried out on the left side. Unless the structures are fixed or the pedicle very long and thin, it can either be felt as a distinct tense band or the finger can be hooked around it. In this manner a certain diagnosis can be made both of ovarian tumor and of the side from which it takes its origin.

The opposite ovary should, if possible, be palpated.

DIFFERENTIAL DIAGNOSIS. *From Pregnancy.*—Occasionally cases of ovarian tumor are met with in which the history resembles most closely that of a four or five months' pregnancy. The differential diagnosis is to be most carefully made.

On inspection the abdomen may present a shape almost identical with that of pregnancy. The findings on palpation may also be confusing, for fluctuation is only imperfectly obtained in those tumors made up of a number of small cysts. The difference in consistency of the various parts may simulate very closely the pregnant uterus, for small parts cannot thus early be made out. The absence of the fetal heart sounds is of no help, for they cannot be heard before the seventeenth to eighteenth week. When heard, beyond a doubt, the diagnosis is at once established.

Before making a digital examination a speculum should be introduced and the vaginal and cervical mucous membranes inspected. A bluish tint of the mucous membranes (Montgomery's sign), especially if associated with a rhythmic change of color from a purple to pink points to pregnancy. On palpation the finding of a small, hard cervix is in favor of tumor, while a soft cervix, particularly if found to be alternately softer and firmer, speaks for pregnancy. Care should be taken in pulling down, as has been described, a uterus in which pregnancy is suspected, but if none of the foregoing signs are present and a tumor is probable, this may be done and the outlining of a small uterus will confirm with certainty the diagnosis. In the case of a large fleshy patient the diagnosis between ovarian tumor and pregnancy may be most difficult, and indeed at times impossible. In case there is any doubt the patient must wait from four to six weeks, when the diagnosis can be cleared up. In no doubtful case should the uterine sound be passed.

A dead fetus or the presence of hydramnios may increase the difficulty.

A pregnancy in one horn of a bicornuate uterus may readily be mistaken for an ovarian neoplasm and must always be borne in mind.

From Abscess and Exudates.—The history, the fixed, indurated, and painful tumor, and the indefinite outline above will differentiate inflammatory conditions. The leukocyte count may also aid in the diagnosis.

From Myoma Uteri.—Interstitial myomata of this size may become cystic and closely simulate ovarian cyst. The differential points mentioned in the diagnosis of the smaller tumors should be made out. In a thin patient the round ligaments may be palpated and serve to distinguish a fibroid. By investigating the relation of the tumor to the uterus, by traction on the cervix, and the finding of the normal ovaries will furnish definite information.

From Kidney Tumors.—Cysts of the kidney may lie in the pelvis and be confounded with ovarian cysts. The points of differentiation are the absence of the pedicle attached to the uterus, the palpation of the normal ovaries, and the fact that the tumor may be pushed into one or the other kidney region. An enlarged and prolapsed spleen has a characteristic shape and can usually be put back into the left flank.

From Phantom Tumors.—So-called phantom tumors arise from contraction of the abdominal muscles, from the deposition of fat in the mesentery, omentum, or abdominal walls and from the distention of the intestines with gas. They are less definite and less circumscribed than actual tumors. When caused by a contraction of the muscles they will disappear if the patient's attention is distracted, and will be resonant on percussion, as is also the case when caused by an accumulation of gas in the intestine.

In some cases it may be necessary to administer an anæsthetic before a decision can be reached. Under its influence the tumor disappears and the vertebræ can be palpated.

Tumors of Large Size.—By large tumors we mean those filling the abdomen and extending upward under the ribs. The solid tumors may reach this size but rarely, so that we have to consider practically only the cysts.

On inspection the abdomen is usually symmetrical and dome-shaped, with the umbilicus at the most prominent point. The floating ribs and cartilages may be bent forward, forming an obtuse angle with the rest of the chest wall. The skin over the abdomen may be thick and indurated but is more frequently thin, showing enlarged tortuous veins and well-marked linæ atrophicæ.

On palpation the swelling is boggy, at times uniformly so, at others showing areas softer or harder, according as the tumor is made up of one large cyst or a number of smaller ones. Small cysts on the surface may be felt as knobs or bosses. When one large cyst is present, fluctuation can be distinctly elicited; in cases of aggregated smaller loculi, it may be indefinite.

On percussion the tumor is dull and is surrounded by a corona of resonance in the flanks and in the epigastrium. Below, the dulness extends to the symphysis pubis.

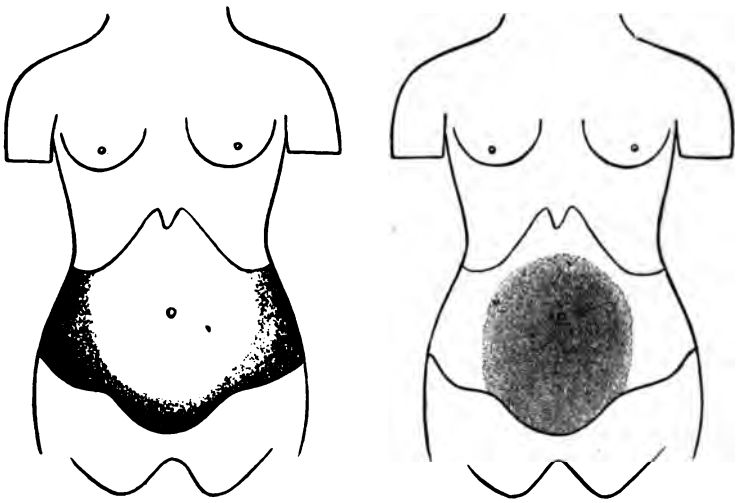
The tendency of a large tumor to press downward on the pelvic floor often causes the uterus to descend and lie low in the pelvis. It may however, be caught above the symphysis pubis and so lie high up, becoming an abdominal organ. In this case the vagina is elongated and the cervix reached with difficulty, lying high and close behind the

symphysis pubis. Unless the tumor is very large the pedicle can be palpated in the manner described.

DIFFERENTIAL DIAGNOSIS. *From Ascites.*—Ovarian cysts are most frequently confounded with ascites. I have seen a patient with a typical ovarian cyst brought to the hospital by friends, after many months of treatment by a physician for dropsy, supposedly due to liver trouble. Several points are characteristic, and by carefully noting them mortifying mistakes will be avoided.

1. *Shape.*—With the patient lying flat on a table or couch the contour of the abdomen is noted. Is it dome-shaped, with the umbilicus at the top of the swelling, or is there a plateau at the top in the umbilical region and slight depression of the umbilicus? Are the flank lines but slightly bulging or is there marked sagging at the sides?

FIG. 268



Comparison of the areas dull on percussion in ascites (left) and ovarian cyst (right). Patient lying on her back. (After Spencer Wells.)

2. *Fluctuation.*—Is the fluctuation wave very distinct, being instantly transmitted, or is it indistinct and sluggish?

3. *Percussion Note.*—Is there dulness in the centre and tympany at the sides and in the epigastrium or is the flatness in the flanks with an area of tympany above in the umbilical region? On moving the patient from side to side does the flatness change, being present in the dependent parts? (Fig. 268).

4. Is the liver enlarged, as examined by percussion? Are the heart sounds normal? Does the urine give evidence of kidney trouble? Is there also fluid in the pleural cavities and general anasarca?

If all this information is carefully obtained the diagnosis can be made from the following table of signs:

Ovarian Cyst	*Ascites.*
Dome shaped.	Plateau on top.
Umbilicus prominent.	Umbilicus depressed.
Slight bulging in flanks.	Sagging in flanks.
Fluctuation indistinct.	Fluctuation very distinct.
Fluctuation wave sluggishly transmitted.	Fluctuation wave quickly transmitted.
Flatness in umbilical region.	Tympany in umbilical region.
Tympany in flanks.	Flatness in flanks.
Very slight, if any, movable dulness.	Marked movable dulness.
Liver, heart, and kidneys normal (?).	Signs of disease in these organs.

In cases of extreme ascites the area of tympany in the umbilical region may be absent, because the short mesentery will not allow the intestines to float as far upward as the anterior abdominal wall. In such a case the movable dulness may be slight but can usually be made out by very careful study. The wave of fluctuation, however, is very distinct.

Pathology.—The pathology of the various tumors will now be considered, together with such practical clinical points as are characteristic of each.

A. Retention Cysts.—The retention cysts are of no great clinical or pathological importance. Their role in the production of symptoms has been much overestimated in the past and operations for their removal have been far more frequent than is justifiable.

1. *Multiple Cystic Follicles.*—The conversion of the ovary into a number of small cysts is not uncommon, yet we know little either of the cause or of the effects of such a transformation. The ovary is usually considerably enlarged, seldom, however, being more than four or five times larger than normal. Its surface is studded with thin-walled cysts, varying in size from that of a pea to that of a cherry. These are of a bluish tint and contrast sharply with the opalescent connective tissue in which they are embedded. Occasionally one or two may be pedunculated. On section the ovary is found to be riddled with small cysts of various sizes. The cysts have a smooth wall, never presenting any papillary ingrowths and the fluid is limpid and of a light yellow color. The stroma is dense and tough.

When microscopically examined the wall of the cysts is found to be made up of connective tissue, representing the theca folliculi of the Graafian follicle, and the lining to be composed of a single layer of cuboidal cells considerably flattened in the larger cysts, where the tension has been greatest. These cells represent those of the membrana granulosa.

As to the cause of this hydrops folliculi, or dropsy of the Graafian follicles, as the condition has been called, we know nothing beyond the supposition that it results from the failure of the follicles to rupture and undergo the normal degenerative changes. Possibly a chronic oöphoritis may be the primary cause, but, in my experience, it is rare to find any trace of this on microscopic examination.

Such a condition is sometimes found unaccompanied by symptoms. Dysmenorrhœa and menorrhagia are sometimes associated, but at present we do not know the exact effects of such aggregations of

unruptured follicles. They may be found in cases of myoma uteri, and now and then with a large ovarian tumor of the opposite side.

The diagnosis can be made by the rectal examination, the ovary feeling as though covered by a number of buckshot. The condition is usually bilateral.

Formerly such ovaries were removed. On account of the uncertainty of our present knowledge this is unjustifiable. If, on opening the abdomen, such a condition is found, the cysts should be punctured with a knife and the fluid evacuated. Larger cysts should be resected, leaving the remainder of the ovary intact.

2. *Graafian Follicle Cysts.*—When a follicle becomes mature and does not reach the surface of the ovary rupture fails to occur and the fluid accumulates in the cavity thus formed. This may continue until the tumor reaches the size of an egg or even that of a large lemon. It then forms a smooth cyst, usually ovoid in shape and attached to the ovary over a broad base. The walls are thin, especially at the most prominent part. One sees, at times, cysts, apparently formed by the coalescence of two dilated follicles.

Microscopically, the wall is found to be formed of connective tissue arranged in two layers. The outer one represents the ovarian stroma and the inner the theca folliculi. The latter is often fairly rich in blood-vessels. The inner surface is smooth and lined by cuboidal or flattened epithelial cells, which I have never found ciliated, as is often stated.

The fluid is clear serum containing few cellular elements. Desquamated cells undergoing fatty degeneration may often be found. These cysts sometimes rupture spontaneously. On several occasions I have broken them during the course of a bimanual examination, which, indeed, should be the deliberate procedure if a positive diagnosis can be made and it can be accomplished without too much force.

If the symptoms justify an operation the posterior cul-de-sac should be opened, the cyst brought down, emptied by aspiration and resected from the healthy ovarian tissue. A few through-and-through catgut stitches will check the hemorrhage and unite the edges of the oval or V-shaped incision into the ovary. The opposite side should be carefully examined and the opening through the vaginal vault closed without drainage.

Cœliotomy is not indicated when a Graafian follicle cyst is the only abnormality.

3. *Corpus Luteum Cysts.*—A tumor, very similar to the one just described, takes its origin from the corpus luteum. As a rule, they are smaller than Graafian follicle cysts and on palpation are found to be softer. They occur embedded in healthy ovarian tissue or attached to the ovary by a pedicle made up of ovarian stroma.

Their surface is smooth and varying in color from a light yellow to chocolate, the different shades being produced by the amount of degenerated blood which is admixed with the contained fluid. The yellow color of the lutean cells comprising the lining is characteristic.

The walls vary from 2 to 4 mm. in thickness and are quite friable, allowing the contents to escape after very slight injury. When emptied of their contents the inner surface presents a velvety or even shaggy appearance and is of a yellow color.

The fluid is tarry from admixture with blood, and shows, under the microscope, many degenerated red blood corpuscles, leukocytes, and desquamated lutean cells.

Histologically the wall is made up of ovarian stroma with a more or less vascular inner layer. The lining is composed of several layers of large cuboidal cells, containing vesicular nuclei and yellowish granules —the lutean cells, found in the normal corpus luteum.

There are no characteristic symptoms and the treatment does not differ from that of the Graafian follicle cyst.

B. Epithelial Tumors. 1. *Cystadenoma.* (Syn. *Adenocystoma; Cystadenoma pseudomucinosum*).—The cystadenoma is the most frequent

Fig. 269

Large multilocular cystadenoma. (Author's case.)

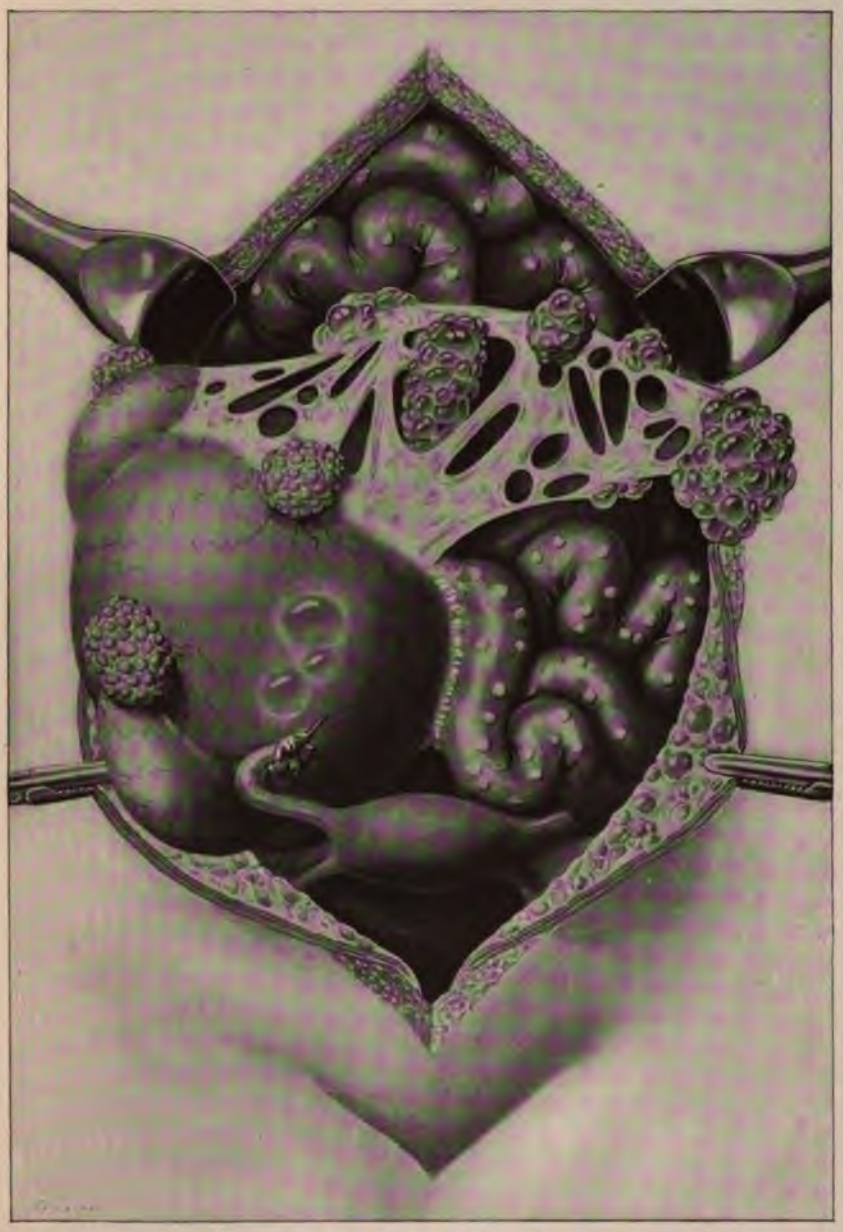
of ovarian tumors, comprising, as we have seen, from 55 to 65 per cent. of all neoplasms developing from this organ. They may occur at all ages but most often develop during the fourth and fifth decades. Kelly has reported a case at fifteen years and has collected over 100 cases operated upon after the seventieth year. I have removed such a cyst weighing eighty-eight pounds from a patient aged seventy-seven years.

These tumors have long been known; indeed, the pioneer work in the field of abdominal surgery was done for their removal.

They may attain immense size, cases having been reported weighing more than the patient after operation. At the present time, however, patients present themselves early and we no longer see the enormous cysts which formerly were not uncommon.

Cystadenomata develop free in the peritoneal cavity and usually assume a spherical or ovoid shape. When small they may be confined within the true pelvis, lying to one side of or behind the uterus. As they increase in size they distend the lower part of the abdominal

PLATE XLI.



Solid Carcinoma of the Ovary, with Extension of the Disease to the Intestinal and Parietal Peritoneum and to the Omentum.
(Dudley.)

cavity, gradually pushing outward the abdominal wall and encroaching upon the intestines.

These growths may be uni- or multilocular, much more frequently the latter. As a rule the tumor is made up of from one to four cysts of large size, with many smaller ones in the walls and in the septa between the larger cavities (Figs. 269 and 270).

Externally they are smooth and glistening, varying much in color. Sometimes they are uniformly of a blue, gray, or pink tint; again, the color of the component cysts may vary, giving the whole tumor a mottled appearance. This variation in the tint is dependent upon the blood supply of the walls and upon the character of the fluid contained in the different compartments. Dark areas in the walls are caused by extravasated and degenerated blood, and the brown, purple, or even black tints of some of the cysts are produced by hemorrhage into the cavity, the fluid becoming mixed with blood pigment. Opaque white

FIG. 270

Cystadenoma successfully removed from a patient seventy-seven years of age. Practically unilocular. Weight of tumor eighty-eight pounds. (Author's case.)

or yellow areas may sometimes be seen on the surface. These are due to the deposition of lime-salts in the walls.

Coursing over the surface are numerous arteries and veins, forming a net work, at times very delicate and beautiful.

The larger cysts are formed by the rupture of the septa between smaller ones, and there is a tendency for the tumor to rotate so that the larger cavities occupy the concavity of the distended abdominal wall.

On cross-section there are seen cavities of various sizes separated by septa and trabeculi of varying thickness. These partitions may be broken through in places, so that one cavity connects with another through a large or a small opening; when large the remains of the septum forms a crescent-shaped projection into the cyst. When the tumor is made up of a large number of small cysts the cross-section appears like honey-comb.

The inner surface of the cavities is smooth and usually of a bluish or pinkish tint.

The fluid contained in cystadenomata differs greatly in different specimens. Sometimes it is thick and viscid, again thin and watery. When thick and tenacious it is usually of a pale blue color resembling more or less the white of an egg. When thin it may be yellow, brown, or red. When hemorrhage has taken place into a cyst and a quantity of blood becomes mixed with the fluid it is brown or black. At times it is cloudy, again clear. Not only do these different characteristics appear in different tumors but the various cysts making up the same specimen may exhibit them, the larger cysts having, as a rule, thinner and darker fluid than the smaller.

The specific gravity of the fluid varies from 1010 to 1040, and it is alkaline in reaction.

In former years, when cysts were far more frequently tapped than at the present time, the examination of the fluid obtained was considered most important and much more attention was given to it than at the present time. It was examined chemically and microscopically.

A chemical examination of the fluid of a cystadenoma will generally reveal the presence of pseudomucin (metalbumin), first carefully studied by Pfannenstiel in 1890, who designated it as a "gykoproteid." It is found only in tumors of this description. In its physical properties it resembles mucin but differs from it in remaining unaltered when treated with acetic acid. When split up with hydrochloric acid it yields a substance which will reduce Fehling's solution. It is most frequently found in the tenacious, ropy, and seldom in the thin, watery fluid.

Test for Pseudomucin.—To 50 c.c. of cyst fluid, add 50 c.c. of alcohol. Wash the precipitate with alcohol and then free it from the same by pressing out between filter papers.

Select about one-third of the mass and boil on the water-bath with 10 per cent. HCl for one-half hour. After cooling, the mixture is treated with phosphotungstic acid and filtered. The filtrate is then tested with Fehling's solution.

If a positive result is obtained it signifies the presence of mucin or pseudomucin. To differentiate the two a second portion of the mass, obtained by precipitation with alcohol, is rubbed up with water, and a third portion with 1 per cent. NaOH, and both are allowed to stand for one or two days in a cool place. They are then filtered, and if neither filtrate gives a precipitate, when treated first with dilute and then with glacial acetic acid, the substance is pseudomucin.

Pseudomucin is formed by the cells lining the cyst cavities. If examined microscopically the fluid is found to contain crenated red blood corpuscles, leukocytes, desquamated epithelial cells, cholesterin crystals, and granular debris.

For microscopic study of the cyst wall sections should be taken from a portion showing a large number of small cysts. The hardening and embedding should be done with great care in order not to destroy the delicate lining cells.

The outer wall and the trabeculæ and septa will be found to be made up of dense fibrous tissue, having small, long, connective-tissue cells with rod-shaped nuclei. Bloodvessels are rarely abundant. Areas of calcareous deposit, taking a deep blue stain with the hæmatoxylin, may be seen, as well as small brown spots where blood pigment has been deposited. The character of the lining cells is best studied in the very small cysts, for in the larger ones, where the fluid is abundant, the pressure will have altered the cells. These are arranged in one layer and are of the high cylindrical variety, having a small nucleus situated at the base. With hæmatoxylin the protoplasm assumes a purplish hue, which is quite characteristic and is probably due to the granules of pseudomucin which can be readily seen in some of the cells. Cilia may or may not be present.

It is probable that the cystadenomata have their origin in the germinal epithelium.

There are no characteristic symptoms of this variety of tumor.

2. *Papilloma.*—Papilloma, also cystic, occurs much less frequently than cystadenoma, from which it differs in a number of important points. Kelly found 30 cases among 138 ovarian neoplasms, and in 9 of these the disease was bilateral. This is the case much more frequently than in cystadenoma; in 60 of Pfannenstiel's cases, 29 occurred on both sides.

The tumor takes its name from the papillary masses which may be found projecting from the outer surface into the peritoneal or pelvic cavities, or from the inner surface into the interior of the cysts. These outgrowths are usually grayish white or yellow, the smaller masses resembling skin warts, the larger ones cooked tapioca.

The tumor may reach almost any size, but it rarely grows as large as does the cystadenoma. From the size of an orange to that of an adult head is usual.

Histologically the stroma of the cyst wall and the papillary outgrowths is found to be made of connective tissue, usually less dense and more vascular than that of the more frequent ovarian cyst. The cavities are lined and the surfaces of the papilloma covered by a single layer of cylindrical epithelium, usually not as high as that of the cystadenoma. As a rule the cells are ciliated, but Williams has shown that this is not invariably the case.

While not malignant in the sense of producing metastases in distant parts, through the blood stream and lymph, these papillary masses tend to form implantation growths on the peritoneum covering the broad ligament, tube, uterus, and intestines. In some cases these secondary growths have mysteriously disappeared after the removal of the primary growth.

The rapidity of the growth varies; in some instances the development is very rapid, in others the history may extend over a number of years. I know of one case on which an operation was attempted thirteen years ago, and, although the enlargement is now tremendous, the patient has, until recently, enjoyed fairly good health.

These tumors are often accompanied by ascites, which at times may be marked.

The diagnosis can now and then be made by feeling, per rectum, the papillomatous masses in the cul-de-sac behind the uterus. When composed of small cysts, the sensation to the examining finger is that of a bag of shot; when larger, of a bunch of grapes. The association of ascites with an ovarian cyst may cause a suspicion of either papilloma or carcinoma.

3. *Carcinoma.*—Carcinoma may be subdivided into two groups. The first comprises those tumors which have developed from the normal ovarian epithelial elements and called, by Gebhard, genuine, idiopathic carcinoma. The other group is made up of those which have developed from portions of other previously formed ovarian tumors—the so-called carcinomatous degeneration.

Idiopathic carcinoma may form either a solid or a cystic tumor. It develops rapidly but rarely reaches a size larger than a child's head. Usually they are of irregular form and of rather soft consistency. The surface is of a varying color, due to the differences in the blood supply; sometimes pearly white, again a deep red or purple. It is often furrowed, the tumor having distinct lobes; bosses and knobs may form bizarre shapes.

On cross-section the cut surface appears more or less homogeneous, but on closer examination small nests of tissue can be made out, separated by delicate connective-tissue trabeculæ. Cystic spaces of different sizes may be encountered in tumors supposed to be solid. These are due to degeneration and are filled with a cloudy fluid, generally admixed with blood. Areas of hemorrhagic extravasation, recent and old, are often met with.

On microscopic examination the structure is found to be that of an adenocarcinoma—*i. e.*, to be of the glandular type. Gland-like spaces of all shapes and sizes occur, filled with epithelial cells. In the more recently formed spaces these are of the cylindrical variety, but later become atypical, so that they may have almost any shape or size. The nuclei stain deeply and karyokinetic figures are numerous. Delicate trabeculæ of œdematous connective tissue separate the cell nests; in them run the bloodvessels. In some specimens the trabeculæ may be almost lacking, so that it is difficult to differentiate the tumor from a sarcoma.

Carcinomatous degeneration may occur in any of the ovarian tumors which contain epithelial elements. At times the whole neoplasm is affected; again but a certain circumscribed area. The latter is the more common.

The areas of degeneration, when of any size, can usually be recognized at once with the naked eye. Smaller areas are found in the laboratory during the course of a systematic examination of the specimen. If the section is from a portion in which the degeneration is just beginning an irregularity of the epithelial cells is noticed. Some of them are out of line, occur perhaps in several layers, stain more deeply than the others, and show more numerous karyokinetic figures.

Given a rapidly growing tumor, rapid emaciation, more or less pain and free fluid in the abdominal cavity, one may be suspicious of a carcinoma, either of the idiopathic or secondary kind. The history of a bloody fluid having been drawn off, at a tapping, points to malignancy, and the finding of metastatic growths elsewhere renders a certain diagnosis possible.

FIG. 271

Fibroma of the ovary. Cross-section. (Peterson.)

The cancer cells show a tendency to break through the limiting capsule, so that implantations on the peritoneum covering the other organs are frequent. Often the omentum is studded with nodules, and in the later stages the liver rarely escapes.

Ovarian carcinoma may also be secondary to that of the liver or stomach.

C. CONNECTIVE-TISSUE TUMORS. 1. *Fibromata.*—Fibroid tumors form, according to Pfannenstiel, from 2 to 3 per cent. of all ovarian neoplasms. They are to be separated from the condition known as

fibroid ovary or fibrosis of the ovary, in which there is an overgrowth of connective tissue but a retention of a greater or a smaller number of Graafian follicles. Such an ovary is enlarged, but the form is preserved.

The true fibroid tumors may be any size, from a small excrescence on the surface of the ovary to a tumor the size of a fetal head. Not infrequently they are bilateral. They form very dense, hard growths,

FIG. 272

Fibroma of ovary. 13 x 11 x 10 centimetres. (Peterson.)

yellow or gray in color, smooth on the surface and poorly supplied with blood. Calcareous or myxomatous degeneration is frequent, the former producing chalky deposits on the surface or in the interior, and the latter cysts partially filled with thick, cloudy fluid (Figs. 271, 272, 273, and 274).

On cross-section they appear sometimes of an homogeneous yellowish-gray color; again, bands of connective tissue may be seen running in all directions and interlacing with one another, after the manner of the bundles of muscle tissue in a myoma uteri. They may appear at any age and grow very slowly. Sänger reports a case which was under observation for thirty-seven years.

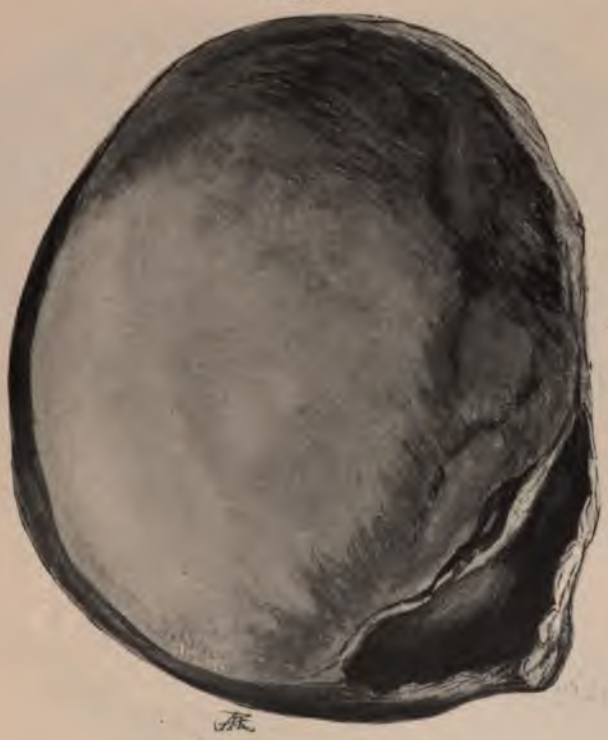
The symptoms are not characteristic. Scanty menstruation or amenorrhœa, when the tumors are bilateral, is the rule.

A frequent complication is ascites and an abdomen partially filled with fluid, in connection with a hard movable tumor, which can be pushed about from side to side, is characteristic. An almost perfect ballottement can often be elicited.

Microscopically, sections show dense connective tissue, usually poor in cells, having a fine rod-shaped nucleus and few bloodvessels.

2. *Sarcoma.*—Sarcomata occur somewhat more frequently than fibromata. Statistics, based on 1106 cases of malignant tumors, collected from sixteen different clinics, gave 14 per cent. of sarcomata. Of 73 malignant tumors which I studied at the Johns Hopkins Hospital, 11 were sarcomata, or 15 per cent. In general, they resemble fibromata in size, form, and color. The surface is often more glistening and they are frequently softer than the fibroids. When a large amount of fibrous tissue is present, forming a fibrosarcoma, it is often difficult to differ-

FIG. 273



Ovarian fibroma. (Peterson.)

entiate at the operating table the neoplasm from a fibroma. Such a combination may be present from the beginning or sarcomatous degeneration may take place in a fibroma, in which case the cellular elements are not so homogeneously diffused, being more limited to the degenerated areas.

Sarcoma appears in two forms: (1) spindle-cell and (2) round-cell, the former being the more frequent. These are also less malignant and resemble quite closely the fibromata. Those made up of round cells are softer, more vascular, and tend to invade the surrounding structures. Frequently they are densely adherent, and on account of

their softness and the large vessels coursing over their surface, tend to bleed very freely when injured.

Microscopically, the spindle cells are found in sheaths and bundles, with the bloodvessels running between them.

The round cells are arranged in large nests with a minimum of connective tissue between. They may closely resemble the medullary carcinoma.

Both forms of sarcoma are frequently bilateral and grow very rapidly.

FIG. 274

Ovarian fibroma. (Peterson.)

Croback reports a case of a round-cell sarcoma which increased from the umbilicus to the costal margin in twenty-three days.

Pfannenstiel's statistics show 40 per cent. of the cases occurring under twenty-five years of age, and 6 per cent. under ten.

Degeneration is frequent and may be of the hyaline, fatty, or myxomatous type. Cysts may be formed, and these usually contain a small amount of bloody fluid.

Combination tumors, such as osteosarcoma and chondrosarcoma, are

very infrequent. Those containing bone or cartilage are usually examples of teratomata.

3. *Endothelioma.*—A tumor which is related to the sarcomata is the endothelioma, formerly called angiosarcoma and lymphosarcoma. These develop from the endothelial cells lining the bloodvessels and lymphatics. Clinically they are not to be differentiated from sarcomata.

4. *Myoma.*—Myomata of the ovary, resembling very closely similar tumors of the uterus, occur, but they are usually small and of no importance.

Orth has reported a true angioma. The cases of myxomata in the literature are instances either of cystadenomata, fibromata, or sarcomata, which have undergone myxomatous degeneration.

D. Dermoid Cysts and Teratomata.—Though closely related genetically, dermoids and teratomata differ clinically and anatomically.

Dermoid Cysts.—By the term dermoid or dermoid cyst we are to understand a tumor whose wall is made up of a structure resembling skin and which contains any or all of the structures of the epidermis, such as sebaceous and sweat glands, hair, and nails. In the layer of "subcutaneous tissue," if this term may be applied to the tissue beneath the lining, bone, muscle, and nerve fibres may occur. Teeth, usually rudimentary, are frequently found, either embedded in the wall, attached to bone, or cast off and lying free in the cyst cavity.

These tumors may be found at any age, but usually not until after puberty, although it is probable that they have their beginning during fetal life or soon after birth. They grow slowly but may reach a very large size. Galabin mentions one weighing 160 pounds.

They may be bilateral, but generally occur on one side only. It is not infrequent to find a dermoid combined with a cystadenoma and forming an integral part of it.

Most of them are round or oval, smooth on the surface and about the size of a lemon. The consistency depends upon the temperature and the amount of hair, bone, teeth, etc., which they contain. They generally have a boggy feel when palpated bimanually. Seldom can fluctuation be obtained.

For the most part they are unilocular with incomplete bands and septa running across. They may, however, present several cavities.

The interior is filled with a yellow, oily substance, which, at the body temperature, is fluid and resembles melted butter. On cooling, after removal, it becomes solid and somewhat granular. Hair is usually present; most of the hairs having been cast off, form a thick tangle, lying free in the cyst, but some are found still attached to the hair follicles in the wall. Tufts, as long as five feet, have been reported. In color it seldom resembles that of the individual. In negresses it is kinky. Cysts removed from aged patients are said to contain white hair, but this I have never observed.

Finger-like processes, covered by the lining skin, may develop nails. Horns, similar to those which sometimes grow in sebaceous cysts, have been described.

Microscopically, the wall resembles the skin. It is lined by several layers of flat epithelium, and the tissue beneath shows sebaceous and sweat glands, hair follicles, muscle fibres, and fat. Mammary glands, with nipples, have been reported.

In some specimens the fatty contents are not fluid, but coagulated into little balls, in the centre of which are hairs.

Dermoids are prone to become inflamed and to either suppurate or become densely adherent. We then have the symptoms of inflammatory disease—pain, tenderness, fever and leukocytosis. Fistulæ, connecting the cyst with the bladder, rectum, or small intestine may result. Hunner made the diagnosis of dermoid in a case of supposed inflammatory disease, which had been unsuccessfully operated upon per vaginam, by finding on cystoscopic examination a small opening into the bladder, through which were projecting several hairs.

Malignant degeneration, either carcinomatous or sarcomatous, may occur.

Teratoma.—Teratomata are related to dermoids but are distinguished from them by the fact that they are solid tumors, the cells showing a tendency not to secrete but to proliferate. They are rare, occur in early life, and sometimes reach, if death does not result, an immense size. They are very varying in structure and each case is more or less in a class by itself. Sarcomatous or carcinomatous degeneration is the rule.

Histogenesis.—The most probable and now generally accepted explanation of dermoids and teratomata is that they result from parthenogenetic development of an ovum.

E. Tubo-ovarian Cysts.—Occasionally a cyst is found, formed by both the tube and ovary, as when a dilated tube becomes attached to the surface of a Graafian follicle cyst and a communication is established by the breaking down of the septum, separating the two cavities. The communication may sometimes be through the ostium abdominale. The fimbriæ of the tube, in such a case, are spread over the inner surface of the ovarian portion. The manner in which this occurs is not clear. Bland Sutton believes that it results from a peritoneal covering of the ovary, similar to the pouch which normally exists in many animals. As in the case of hydrosalpinx simplex, the condition is undoubtedly the result of previous inflammation.

F. Parovarian Cysts.—The parovarium or epoöphoron, as we have seen, represents the remains of the Wolffian body and lies within the broad ligament, between the hilum of the ovary and the tube. Occasionally one of the tubules of this body is the starting point of a cyst. By a proliferation of the cells, which then begin to secrete a thin fluid large cysts may be formed. They develop between the folds of the broad ligament and are, therefore, intraligamentary.

They may sometimes be recognized before the abdomen is opened, the special points in the diagnosis being as follows:

1. Abdominal examination in the case of the larger tumors reveals a spherical swelling, limited to the lower part of the abdomen. It is

regular in outline, and unless quite large may be definitely located at one or the other side. The fluctuation wave is usually very distinct, but the differentiation from ascites is easy.

2. On bimanual examination the tumor may be found to be distinctly separate from the ovary, but this point is usually most difficult to make out, except in the case of a small cyst. There is no distinct pedicle, but the attachment to the uterus is over a broad surface.

3. The intraligamentary development. The tumor is low down, and while not absolutely fixed as in the case of an adherent inflamed tumor, has but slight mobility. It is in intimate relation with the uterus. On opening the abdomen a parovarian cyst may be easily recognized by the two sets of bloodvessels which are seen on the surface. One set belongs to the cyst proper and the second to the peritoneal covering. The latter may be made to glide over the former by moving the outer membrane. There is no pedicle similar to that of an ovarian cyst.

Parovarian cysts are unilocular. The fluid is thin and resembles serum. Rarely is the specific gravity higher than 1010. Cholesterin crystals are usually found.

On microscopic examination the wall is seen to be made up of three layers: (1) outer, serous, or peritoneal coat; (2) cyst wall proper, thin and composed of connective tissue, containing few cells; (3) epithelial lining. This is composed of a single layer of epithelial cells of the cuboidal or moderately high cylindrical type. The cells are ciliated and have small, round nuclei situated at the base. The cells stain evenly. Nuclear figures are rather rare.

There are no characteristic symptoms of parovarian cyst.

Complications of Ovarian Tumors.—Among the more important and more or less frequent complications of ovarian tumors, we have to consider rupture of the cyst wall, twists in the pedicle of the tumor, infection of the contents of the cysts, the formation of adhesions binding the tumor to adjacent structures, and the association with ascites.

Rupture of the Wall of a Cyst.—The wall of a cyst may rupture, allowing a portion of the contents to be poured out into the abdominal cavity. Gebhard states that this happens more frequently than we suppose, for it is generally unaccompanied by symptoms. The fluid is readily absorbed by the peritoneum and the hole closes, leaving no evidence of the accident.

By the bursting of a cyst the pressure is diminished and the vessels becoming filled with blood, rupture, causing at times a not inconsiderable hemorrhage. This, however, is seldom severe enough to produce symptoms or endanger life.

Cyst fluid being, as a general rule, sterile, peritonitis does not follow the discharge of the fluid into the peritoneal cavity.

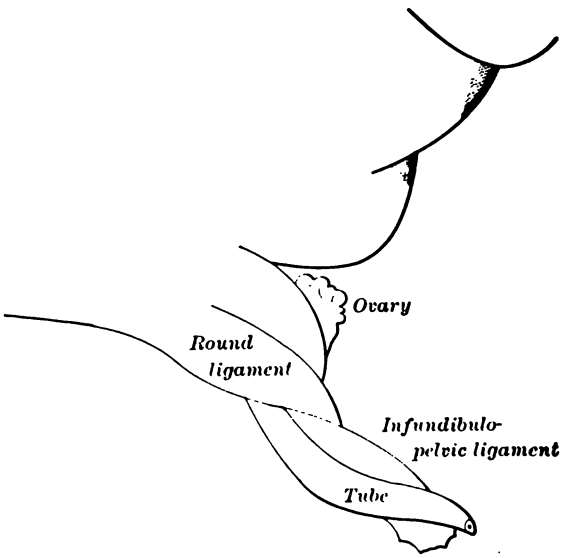
The frequent implantations, in cases of carcinoma and papilloma, are probably to be explained by the rupture of the wall.

Torsion of the Pedicle.—A fairly frequent complication of ovarian tumors is a twisting of the pedicle, causing a partial or complete shutting

off of the blood supply. Schauta states that this occurs in 20 per cent. of all cases. It was found thirty-seven times in 257 cases of ovarian neoplasm at the Jena clinic (14.4 per cent.). Rokitansky estimated that it occurs in 12 per cent. of all cases and is the cause of death in 6 per cent. This accident happens more frequently to cystic than to solid tumors, and most frequently, according to Olshausen, to the dermoids. Tait thinks that it occurs more often on the right side, due, he believes, to the alternate filling and emptying of the rectum (Fig. 275).

Küstner states that tumors of the right side rotate from left to right, while those arising from the left side turn in the opposite direction. The rule held good in 10 of 11 cases observed by him. Kelly ascribes the partial rotation, so frequently seen in multilocular tumors, to the

FIG. 275



Twisted pedicle of an ovarian cyst.

tendency of the largest loculus of the cyst to occupy the concavity formed by the distended anterior abdominal wall, while rotation amounting to or exceeding one turn, is caused by the contraction and relaxation of the abdominal muscles acting more decidedly on the part of the tumor nearest the median line. The rotation of the smaller neoplasms may probably be caused by the peristaltic action of the intestines and possibly also by the intermittent distention of the bladder. Sudden jars may also be a factor in the causation.

The first result of the pressure on the vessels, due to the twisting, is the occlusion of the thin-walled veins. The artery, having thicker walls, is not at first compressed, allowing blood to flow into the tumor. It then has no means of egress; the bloodvessels rupture, and hemor-

rhage takes place into the tissues and cavities of the neoplasm. When the twisting of a pedicle of a large cyst takes place suddenly the hemorrhage may be sufficiently copious to produce syncope and death.

The usual symptoms are severe abdominal pain, pallor, and a noticeable enlargement and hardening of the tumor, which becomes tender on pressure.

The following case, on which I recently operated, is a typical instance of this condition: A Polish woman, aged thirty-four years, had noticed a swelling of the abdomen since her last confinement, two and one-half years previously. This had gradually increased in size, but as it had never caused any distress, the patient paid little attention to it. Three days before her admission to the hospital, immediately after eating dinner, she was seized with sudden sharp pain in the right iliac fossa, and this pain continued until admission. At the onset, she felt faint, but her friends did not notice any pallor of the face. The abdominal distention had markedly increased and there was uniform tenderness on pressure.

At operation the cyst was found to be filled with bloody fluid and there was a small amount of free fluid in the abdomen.

A twist in the pedicle of a small tumor may cause symptoms, when on the right side, closely simulating appendicitis. I have seen three such cases, the following being typical:

A young unmarried woman consulted me as to the advisability of an operation for appendicitis. During the previous year she had suffered three different attacks of what was supposed to be appendicitis, although her physician suspected that there was a small pelvic tumor, probably a uterine myoma. The pain was described as sudden in its onset, starting on the right side but becoming more or less general and accompanied with nausea and vomiting. The examination revealed a small tumor in the pelvis, the relations of which could not be made out. At operation an adherent, degenerated ovarian tumor was found, the blood supply to which had been cut off by a twist in the pedicle.

INFECTION.—It sometimes happens that the contents of a cyst become infected. This occurs either through the blood stream or by the invasion of the cavity by micro-organisms from the intestine through adhesions, formed between the tumor wall and the bowel. The bacterium coli commune is most frequently found.

Huge abscesses are thus sometimes formed, the tumor wall becoming adherent to the adjacent organs. Chills, fever, and intestinal symptoms follow.

On account of the length of time during which a dermoid is present, on account of their slow growth, they are particularly liable to this complication. Their presence may be unsuspected until infection occurs, when the history is that of pelvic inflammatory disease.

ADHESIONS.—In uncomplicated cases, ovarian tumors, not intraligamentary, lie free in the pelvic or abdominal cavity, attached to the neighboring organs only by the pedicle. When complicated by inflammatory disease of the ovary or tube, adhesions may be found between

the tumor and the floor of the pelvis. These are often very dense, and in the case of the smaller tumors they may completely envelop the whole growth, forming the pseudointraligamentary type.

Irritation, with destruction of the surface endothelium, may cause adhesions to the anterior abdominal wall, omentum, small and large intestine, appendix, or more rarely to the liver and gall-bladder. Through these adhesions large vessels may enter the tumor, at times sufficiently large to nourish the neoplasm, and if the pedicle atrophies through a twist or from pressure, the tumor may become parasitic. Tumors originating in the ovary are occasionally seen entirely detached in this manner from the pelvic organs.

Ascites.—Free fluid in the abdominal cavity may be found in connection with ovarian growths. It is much more frequently met with in cases of solid than of the cystic varieties and is the general rule in malignant tumors.

Nothing certain is known as to the cause of the ascites in these cases. Lapthorn Smith believes that solid tumors may rest upon the inferior vena cava and produce obstruction and exudation of serum from the thin-walled veins. In cases of malignant growths he believes that an additional factor is the rapid production of metastases in the liver, causing pressure on the portal veins and a pouring out of serum from the gastric and intestinal vessels.

Another theoretical explanation is that the diseased ovaries give off some substance which either irritates the peritoneum and causes the exudation of serum, or that the irritation blocks up the lymph channels, thus preventing the proper drainage of the peritoneal cavity.

The possibility of ascites with ovarian fibroids should always be borne in mind. I met with a case recently in which the patient had been given up to die because the large amount of fluid which was in the peritoneal cavity was thought to indicate that the ovarian tumor, which could be palpated, was necessarily malignant. At operation, fibroids of both ovaries were found.

This association of ovarian fibroids and free fluid is not uncommon, but until recently has not been sufficiently emphasized.

Pregnancy.—The differential diagnosis between ovarian tumor and pregnancy has been dwelt upon in a previous section. It is now necessary to consider ovarian neoplasms complicated by pregnancy.

The coexistence of the two conditions is not uncommon. Pregnancy may occur even when both ovaries are the seat of a new-growth, but more frequently it complicates a tumor springing from one side, the opposite ovary being unaffected.

It is necessary to consider the effect upon the pregnancy, the influence of the pregnancy upon the growth and development of the tumor, and the treatment to be pursued when the coexistence of the two has been diagnosticated.

If the tumor is small and there are no adhesions binding down the affected side and interfering with the development of the uterus upward, the pregnancy may be uninterrupted. Such is usually the case in

instances of multiple cystic follicles and the smaller Graafian follicle cysts. Dermoids, on the contrary, are, as we have seen, especially prone to become infected, adhesions forming around the tumor and so binding down the uterus that it is prevented from enlarging beyond a certain point.

The same is true of the intraligamentary parovarian cyst. A large cyst, either of the cystadenoma or papilloma type, or a large solid tumor may so fill the available space in the pelvic and abdominal cavities that the uterus, though free, may not have the room to enlarge. When a pregnant uterus is either bound down by adhesions or crowded by a large ovarian growth, severe pain may be caused and the uterus finally cast off the fetus, an abortion or a premature birth resulting.

One might suppose that the increase in the blood supply to the pelvic organs during pregnancy would cause an ovarian neoplasm to rapidly increase in size, but according to the investigations of Löhlein and Olshausen, pregnancy seems to have little or no influence upon their growth.

Such is not the case, however, when malignant degeneration is considered, for the observations of a number of reporters seem to establish the fact that pregnancy enhances the possibility of this misfortune, and this should be constantly kept in mind in deciding as to operative interference.

Certain other complications of ovarian tumors are also more frequent when pregnancy coexists. Among them are torsion of the pedicle, peritonitis, infection of the cyst contents, and cyst rupture.

Olshausen is of the opinion that rotation of the pedicle is no more frequent with a pregnancy than in the simple cases. Thornton, however, found 10 per cent. of his torsion cases during pregnancy, Martin 20 per cent., and Williams states that it is three times more frequent when a pregnant uterus is present. It happens more frequently in multiparæ than in primiparæ, in the early months than in the late months, and in small than in large tumors. Löhlein believes that torsion readily occurs during the puerperium, the factors producing it being the involution of the uterus, the lessening of the abdominal pressure and the posture assumed when sleeping upon the abdomen.

Peritonitis, a frequent sequela of torsion, may occur, though of low grade and of good prognosis. Hartman and Morox have reported two cases studied bacteriologically, in both of which the cultures were sterile. The greatest danger in such cases is not from the primary infection but from the dense adhesions, which may form between the tumor and the pelvic organs and the intestine, giving the intestinal bacteria an opportunity to penetrate the adhesions and so infect the neoplasm.

The infection of a cyst may result not only from torsion of the pedicle but also during the puerperium, as a result of faulty technique in the delivery.

Cyst rupture occurs somewhat more frequently in pregnancy than in simple cases. Of the 375 instances of ovarian tumors and pregnancy, collected by Williams, there was rupture in 3.5 per cent., while this

complication occurs in but 2.4 per cent. of cases when pregnancy is not present. During delivery and in the puerperium, rupture is somewhat more frequent.

Intracystic hemorrhage is, apparently, not more often met with when pregnancy complicates the neoplasm.

The prognosis of ovarian tumor, when coexisting with pregnancy, is always to be regarded as grave, although many cases will go on to full term and a spontaneous delivery follow. The dangerous complications which may supervene, the difficulties which may be encountered during the labor, and the possibilities of trouble during the puerperium, all argue for operative interference. This should be considered as soon as the condition is diagnosticated.

The induction of abortion or of premature labor, the withdrawal of the fluid by tapping, if the tumor be a cyst, and radical operation are to be considered.

While the induction of abortion, or more frequently of premature labor, has had its advocates in the past, the high mortality accompanying the procedure and the fact that the life of the child is more frequently than not destroyed, together with the fact that after it is done the patient still suffers with the tumor, are all sufficient arguments against this treatment.

The tapping of a cyst during pregnancy is open to the same objections as the tapping when pregnancy is not present. It is, at best, only a palliative measure. Cysts are usually multilocular and cannot be completely emptied. Partial emptying may predispose to torsion of the pedicle and the danger of infection is great. In cysts, unexpectedly malignant, it is particularly hazardous, and in any case dangerous adhesions may result from the practice. Cases from the literature show that, even after frequent puncture, radical operation is often necessary before the end of pregnancy. Wachenheimer has reported 7 cases in which the uterus was perforated. The mortality varies from 19 per cent. (Foch) to 50 per cent. (Peaslee). Tapping should be resorted to only when, for any reason, radical operation is out of the question or when labor is hourly expected or actually begun.

Tarnowski, who has collected a large number of statistics of simple ovariotomy and of ovariotomy during pregnancy, finds that the mortality of the former is 10.3 per cent. and of the letter but 5.4 per cent. He urges early radical operation for the following reasons:

1. Because of the frequency of malignant degeneration during pregnancy and the puerperium.

2. Because of complications, such as torsion of the pedicle, cyst rupture, and infection of the contents of the cyst.

3. Because the prognosis of spontaneous delivery is much worse when complicated by ovarian tumor.

4. Because the longer a tumor remains the more difficult becomes the operation.

5. Because the mortality, when operated on early, is no greater than in simple cases.

EXPLANATION OF PLATE XLII.

OVARIOTOMY.

A. **Examining the Tumor.**—The abdomen having been opened by an incision in the median line, the hand is introduced into the peritoneal cavity in order to determine the presence or absence of adhesions, and to break up any slight adhesions which may be found.

B. **Tapping the Cyst.**—The patient is on the right side. A folded, flat gauze sponge is partially introduced into the peritoneal cavity and held by the left hand of the operator, in order to absorb any fluid which may escape from the cyst. The operator, with his right hand, plunges the trocar into the cyst. The fluid is evacuated through the trocar and the attached rubber tube into the bucket below. (Dudley.)

PLATE XLII.

Explanation of Plate XLIII.

A. As the fluid passes from the cyst through the trocar and the sac begins to collapse, the trocar is placed in the hands of an assistant, and the operator with a heavy long forceps in each hand seizes the sac on either side of the trocar at points *a* and *b*, and makes steady traction, so that, as the sac is emptied and collapsed, it may be drawn out through the abdominal incision. During the emptying of the sac it is seized successively at different points by first one forceps and then the other until it is delivered. The delivery of the sac in this manner by traction usually would be rendered impracticable or impossible by adhesions; see *A*, Plate XLIV.

B. The sac has been emptied or nearly emptied. The wound in the sac-wall made by the trocar is closed temporarily by the Nélaton sac forceps *c*. Forceps *a* and *b*, by which the sac has been drawn through the abdominal incision, are hanging upon the cyst-wall. The pedicle is clamped by two strong forceps, *c* and *d*, which then are placed in the hands of the assistant, and the pedicle is divided between them by means of scissors in the right hand of the operator, while his left hand holds the tumor steady. (Dudley.)

PLATE XLIII.

Explanation of Plate XLIV.

A. If the sac is adherent to adjacent structures, the adhesions must be broken up before it can be delivered through the abdominal wound.

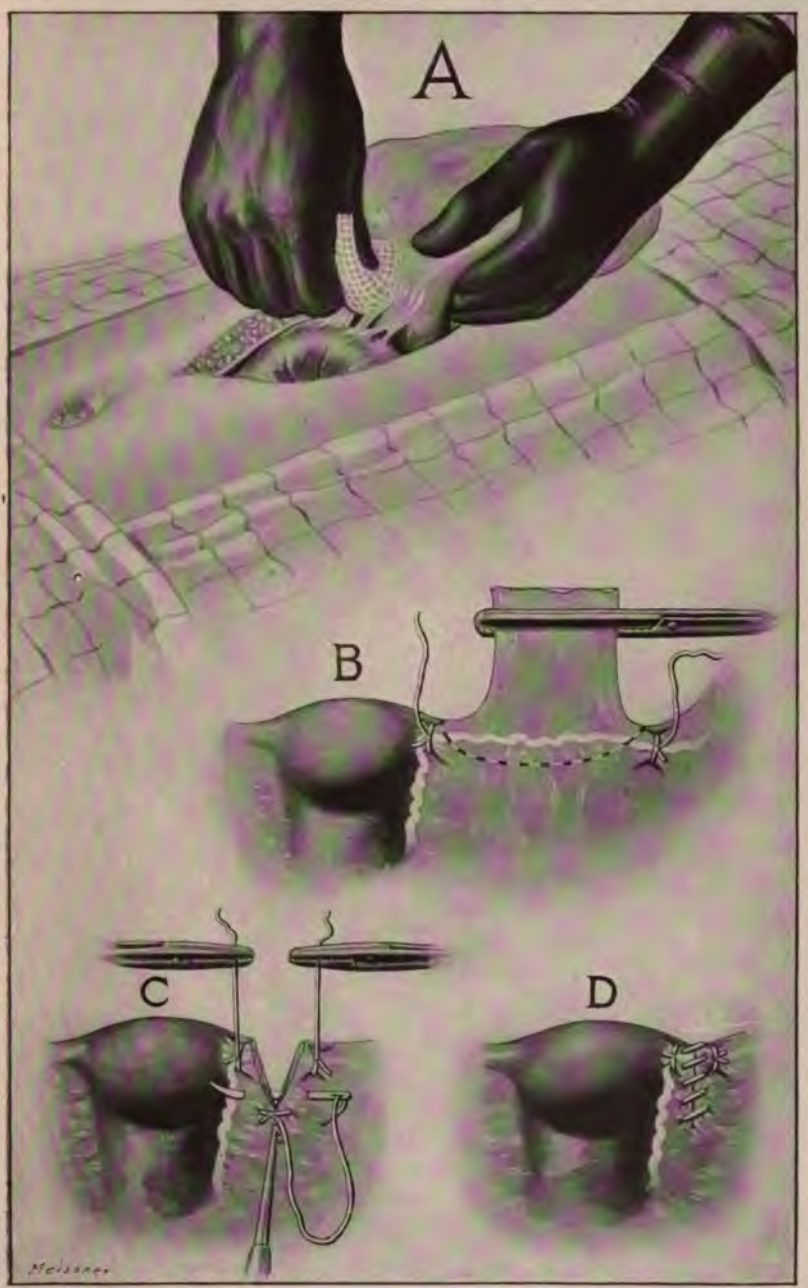
Here adhesions are shown between the sac and the intestine, and are being broken up by strong pressure with the sponge in the right hand of the operator while his left hand holds the sac. Very extensive and firm adhesions may be separated—sponged off, as it were—in this way.

B. The sac has been delivered through the abdominal incision, the pedicle clamped, and the tumor removed. Here the pedicle is shown temporarily clamped by a strong forceps. This forceps corresponds to forceps *c*, Plate XLIII, *B*. Two strong ligatures *en masse* have been introduced and tied one on each side of the pedicle. These ligatures control the ovarian vessels. The black and white dotted line shows where the incision for the removal of the pedicle is to be made.

C. The pedicle has been removed by an incision along the dotted line shown in *B*. The ligatures which surround the ovarian vessels *en masse* are being held taut each in a pressure forceps, while a tenaculum makes downward traction on the centre of the cut edge of the broad ligament. This shows the cut edge folded and being united upon itself by a continuous suture.

D. The suture uniting the wound in the broad ligament is completed. (Dudley.)

PLATE XLIV.



APPENDICITIS.—As has been stated, a small ovarian tumor, the pedicle of which has become twisted or which is surrounded by inflammatory adhesions, may be mistaken for acute appendicitis.

Acute appendicitis may develop in a patient who has an ovarian cyst or a solid ovarian tumor, in which case the diagnosis may be rendered difficult on account of the displacement of the cæcum and the appendix. When the diagnosis has been made operation should be resorted to at once, and, if the appendix can be removed without soiling the peritoneal cavity, the incision should be extended and the tumor removed, great care being taken in the evacuation of a cyst to spill as little of the fluid as possible in the abdominal cavity. If, on the contrary, the appendix is perforated or gangrenous, it is safer to drain and not attempt to remove the tumor.

More frequently, however, inflammation of the appendix is secondary to the ovarian neoplasm and is chronic, the appendix being adherent by the tip or over a portion of its length to the tumor. Such a condition may be unsuspected and found only after the abdomen is opened or the presence of pain and slight tenderness on the right side low down may permit of the diagnosis before operation. The case referred to in the section on differential diagnosis was thought by one surgeon to be appendicitis, the small cyst having been overlooked. After finding the tumor, it seemed probable, from the history, that the appendix was adherent and such was found to be the case.

Thienhaus has reported an interesting case which, while not unusual, is an excellent illustration of the condition. A woman, three months pregnant, had been in bed two months supposedly with appendicitis only. On examination a tumor of the size of the fist was found in the cul-de-sac, which at operation proved to be a cyst with a long pedicle. The appendix, about 14 cm. in length, was adherent to the cyst and twisted around it at the point of connection of the cyst and its pedicle.

When an adherent thickened appendix is found it should always be removed. The adhesions may be severed between forceps, the tumor removed, and the appendix dealt with later or, in case the exposure of the appendix is easy, the operation may begin with its detachment from the cæcum. A cuff is made and turned down, the appendix amputated, the edges of the cuff turned in, and the mesentery tied off, thus leaving the appendix adherent to the tumor. Care should be taken to cleanse and sterilize the basal end of the appendix.

Treatment of Ovarian Neoplasms.—The treatment of tumors of the ovary is always operative. The time to operate is as soon after the diagnosis is made as possible. The only exception to these two rules is in the case of a tumor of the first group—the retention cyst.

When producing no symptoms ovaries with multiple cystic follicles, or with an attached Graafian follicle or corpus luteum cyst, may be left alone, or in the case of a single cyst of either variety may be ruptured by bimanual manipulation, as has been stated. Such tumors, however, will rarely be discovered, unless symptoms are produced by them.

In all other cases immediate operation is to be advised, for with the

perfection which aseptic surgery has attained, they can be removed, when the operation is undertaken early, with practically no mortality.

When left *in situ* they are a constant menace to the life of the patient. Infection, with the production of dangerous adhesions and consequent intestinal symptoms, may occur at any moment. A rupture of the wall, as we have seen, is not infrequent. While this is usually harmless, adhesions may result, or, in the case of a malignant or semimalignant tumor, implantations may occur which may later render the tumor inoperable and be the cause of death. Pregnancy may intervene and either complicate and render more dangerous the operation or impede or altogether hinder the labor. Twists in the pedicle are a constant menace.

Furthermore, malignant degeneration of a benign tumor is sufficiently common to be in itself the sole indication for early operation.

Formerly tapping, or the withdrawal of the fluid by means of a trocar and cannula, was commonly done. This is ordinarily a useless and dangerous procedure, useless, because the cyst rapidly refills and dangerous because adhesions always form at the point where the trocar is introduced.

If for any reason radical operation is out of the question and the distention becomes so great that the fluid must be removed, it is far better to introduce the trocar through a small opening in the abdominal wall than to puncture the latter, as is frequently done. One proceeds then as follows:

The patient should be placed on a table or bed with the shoulders well supported, or, in case there is orthopnœa, preventing this posture, she may sit in a chair, leaning back as far as is comfortable. Care is taken that the bladder is empty. The skin over an area at least 15 cm. square in the median line, midway between the umbilicus and the symphysis, is shaved and cleaned in the manner later to be mentioned in connection with the radical operation. This must be thoroughly done. The disinfected area is then surrounded with sterile towels.

Local anæsthesia is to be attained by using a solution of cocaine, to which adrenalin has been added. This solution is best prepared by adding 10 drops of a 1:1000 adrenalin solution to 15 c.c. of a 1:200 sterile cocaine solution. Only a portion of this is usually required, but all may be used without fear of toxic effects. If preferred the ordinary Schleich solution may be employed and may be used fearlessly in any amount.

The cocaine is injected with the ordinary hypodermic syringe into the skin—not beneath it—care being taken to always introduce, after the first prick, the needle into the area already infiltrated. An incision, not over 2 to 3 cm. in length, is then made through the skin and subcutaneous fat down to the linea alba. The fascia is then cocainized and divided, exposing the peritoneum. The latter is very sensitive and should be thoroughly infiltrated before it is incised. The anterior wall of the tumor now appears and may be carefully examined both by inspection and palpation. The trocar and cannula are next introduced,

the former removed, and the fluid carefully drained off through the cannula, to which is attached a tube sufficiently long to empty into a bucket placed upon the floor. A cyst, which is practically unilocular, may be thus emptied and the distention relieved. The hole in the cyst wall is now closed with catgut and the opening in the abdominal wall brought together by two or more through-and-through silkworm-gut sutures.

The adrenalin will cause a contraction of the bloodvessels, and one must therefore be careful to ligate the larger ones, as otherwise slight hemorrhage may later take place.

A light dressing is held in place by strips of adhesive plaster.

Such a procedure is less dangerous than the other method of tapping and has the advantage of permitting a limited but more or less valuable exploration of the tumor. But it should never be done in preference to the radical operation, and only in such cases as occasionally present themselves when removal of the tumor is out of the question.

An operation being urged and accepted, a choice of two possible routes must be made, depending upon the size, character, and accessibility of the tumor. Small, solid growths, which are freely movable, and cysts of moderate size which are apparently composed of one large cavity and can be easily emptied of their contents, may be removed by the vaginal route, provided the vagina is not too small. The vaginal operation has the advantage of being more quickly done, of leaving no abdominal scar, and of a somewhat more rapid convalescence, but cases to which it is applicable are few in number and must be most carefully selected. The abdominal route, preferred by most operators, is, on the other hand, a universal one and applicable to all cases. In competent hands it is not more dangerous and has the distinct advantage of permitting the operator to deal directly with unforeseen complications and to inspect other important abdominal organs, such as the appendix and the gall-bladder.

Abdominal Oophorectomy.—The removal of the ovary or of an ovarian neoplasm was formerly called ovariotomy, a word etymologically incorrect and rapidly passing into disuse. Oöphorectomy, or oöphorocystectomy, as the operation is sometimes called in connection with cystic tumors, was the first of abdominal operations to be done, and before the days of modern surgery resulted in a large mortality. This was reduced by the use of antiseptics and has been further diminished by the aseptic methods which have supplanted the antiseptic procedures.

The preparation of the patient should begin at least two days before the time set for the operation. If possible to keep the patient in bed, on a light but nutritious diet for a week before, it will be found to hasten the convalescence and lessen the suffering from backache and flatulence, often troublesome postoperative symptoms. However, the suspense and worry which some patients suffer will more than offset the advantages to be gained by the prolonged preparation, and under such circumstances two days will suffice. The surroundings should be as pleasant

and as cheerful as possible. The urine must be most carefully examined and the condition of the heart and lungs assured.

Light diet may be given until noon, and liquid nourishment in small quantities until midnight of the day before the operation.

The incision is made either in the median line or through the right rectus muscle. This is made long enough to permit the introduction of the whole hand, but before this is inserted it is well to retract the edges of the abdominal wound and inspect as much as can be seen of the tumor wall, the parietal peritoneum, the omentum, and the intestines. Implantation growths, adhesions, and areas of necrosis and degeneration are to be looked for.

The whole hand is now introduced and carefully passed around the tumor, separating light adhesions and recognizing denser ones. The uterus is felt for and the pedicle of the tumor sought. In this way the relations of the growth are made out.

If the tumor is solid, or if there is the slightest suspicion of malignancy or of infection, the incision is to be extended until sufficient room is gained to deliver the growth. In doing this great care is taken that the bladder is not injured. The tumor is now brought out upon the sterile towels and gauze pads, moistened with normal salt solution at 110°, packed around the intestines. Several towels wet in the same way are placed over the incision, it being the purpose of the operator to keep the contents of the cavity both warm and moist.

Before clamping off the pedicle it is well to examine the opposite ovary and determine whether or not it can be left. If so the relations of the pedicle are now studied and its component parts made out. A large clamp is put on the portion representing the infundibulo-pelvic ligament and smaller ones on the tube, round ligament, and utero-ovarian ligament. The pedicle is severed with knife or scissors. Catgut or silk ligatures, as the operator prefers, are now substituted for the clamps and the latter are removed. It is well to now isolate the ovarian vessels and the anastomosing branch of the uterine (located in the broad ligament from 1 to 2 cm. from the uterus) and tie them separately with catgut. After all bleeding points are controlled the severed infundibulo-pelvic ligament is sutured to the cornu of the uterus and the whole neatly closed in with peritoneum sutured with a continuous stitch of catgut.

In case the opposite ovary must be removed, it is well to also take out the uterus. If the tumor is large and is in the way it may be quickly clamped off and removed; if small it may be left attached to the uterus. The left uterine artery is tied, the cervix cut across, the right uterine vessels secured in a clamp, as is the right round ligament, and the right ovarian vessels clamped. The more exact details of the operation are given in the description of hysterectomy by supravaginal amputation.

If the ovarian tumor is malignant, panhysterectomy, with removal of the opposite ovary, should be done.

In removing a cystic tumor some operators make but a short incision and bring out the sac after evacuation; others make an incision large enough for the delivery of the tumor intact, providing, of course, this

is possible, even in the case of an apparently uncomplicated cystadenoma. The delivery without puncture should be done if possible, for the following reasons: A long incision heals as quickly as a shorter one, and if carefully sutured is no more liable to be followed by hernia. One never knows when areas of infection or necrosis may be present within the tumor. Apparently benign tumors not infrequently contain areas of carcinomatous degeneration or semimalignant papillary ingrowths. By scattering cells from these areas, implantation growths may later develop. It is very difficult to evacuate the cyst contents without spilling some into the abdominal cavity and almost impossible to remove all of it when spilled. That which remains, especially if it be thick and gelatinous, furnishes an excellent pabulum for microorganisms. Despite these disadvantages, it is necessary to evacuate the larger cysts. Before doing so gauze pads, wet with salt solution at 110°, should be tucked under the edges of the incision. A large glass cannula is now pushed into the largest cyst which presents. As the fluid runs out and the walls become lax, they are grasped with clamps and traction is made on the tumor, bringing it out of the incision as far as possible. Several compartments may require evacuation before the tumor can be delivered.

The fluid should be collected and later measured, so that from the amount and the specific gravity the weight of the tumor may be calculated.

ADHESIONS.—The light adhesions, resembling spider webs, which frequently occur between the tumor and the parietal peritoneum, may be separated with impunity by passing the hand over the surface of the growth. When more dense it is best to detach them by wiping with a gauze sponge. If at all vascular they must be carefully severed and the bleeding points caught and tied.

Dense fibrous adhesions may occur between the intestine and the tumor. Great care must be taken in such a case not to wound the intestinal wall. Unless the growth is malignant it is better to leave a portion of the tumor on the intestine than to run the risk of opening the latter. A Pacquelin cautery is often very useful in dealing with vascular adhesions.

If the omentum is adherent it is best to tie and cut 2 or 3 cm. from the neoplasm, leaving the tags attached to the tumor.

If the growth is adherent to the pelvic floor the operation may be very difficult. The dissection of the tumor from the peritoneum covering the iliac vessels and ureter must be cautiously made. If a large oozing surface is left very hot gauze should be packed into the pelvis and allowed to remain until the abdomen is closed. If the bleeding then continues a liberal tampon of washed-out iodoform gauze is inserted and brought out the vagina through an incision in the posterior vaginal vault.

Before closing the abdomen every vestige of bleeding should be controlled. Even a slight ooze, if drainage is not provided (and it is not necessary in most of these cases), will delay the convalescence either by the process of absorption or by the growth of bacteria in the clot.

The condition of the appendix and of the gall-bladder should be noted.

All abdominal pads and sponges must be accounted for with absolute certainty before the incision is closed. Sponges should never be used when the abdomen is open except when clasped in a sponge holder or clamp, and on no account are they to be put inside the cavity and left. The pads are to be carefully counted and checked off from a list. Furthermore, they are to be provided with tapes, at least twelve inches in length, and a clamp fastened to the tape, when the gauze is introduced. The writer has found that a most satisfactory method of easing the mind on the question of the gauze count is to have the pads put up in packages of eight and each gauze numbered by means of a small tape bearing a figure from 1 to 8, which is sewed to the gauze. For each package opened a full set of numbers must be found.

The abdomen is now closed by the method preferred by the operator.

In the case of an intraligamentary tumor the peritoneum is slit over the growth and the latter shelled out of its bed. This can usually be done quite easily. The superfluous part of the sac is then cut away, the severed edges brought together and covered by peritoneum. If there is an undue amount of oozing from the sac a tampon should be inserted.

Vaginal Oophorectomy.—In a certain few selected cases the vaginal route is to be preferred to the abdominal. The indications have already been mentioned.

The preparation should be the same as that for cœliotomy.

The instruments required are practically the same, except that traction forceps and vaginal retractors are necessary.

A small solid tumor can be delivered by careful traction on its pedicle, or a cyst can be brought into the wound by pressure, exerted by an assistant, from above. The trocar is introduced and the fluid evacuated, after which the sac is delivered and the pedicle tied off. The incision is then partially closed, a small opening being left through which a wick of iodoform gauze is introduced. This should be removed on the second or third day.

After-treatment.—The treatment after the vaginal operation is simple. Following the abdominal method the care should be that of the ordinary abdominal section, a mere outline of which will be here given.

The pain is usually not severe and many cases will require no morphine. Codeine phosphate, hypodermically, in doses of one-half to one grain during the first twenty-four hours can usually be substituted for the morphine. If the latter is given the dose should not exceed one-eighth of a grain. For the severe backache which these cases often suffer, from the second to the fifth day, nothing is better than one-half a grain of codeia and five grains of phenacetin, given by mouth. Suppositories of one grain of codeia and twenty grains of trional are excellent to relieve restlessness, which is accompanied by moderate pain.

Sips of hot water may be given as soon as the nausea following the anæsthetic is over. Nourishment, in the form of albumen-water in two-drachm doses, may be begun at midnight of the day of operation

and gradually increased to two ounces on the second day and four ounces on the third day. It is best not to give milk until after the bowels have moved. Soft diet may be given on the fifth and a general light diet on the seventh day.

The bowels should be moved on the third day. Calomel in two-grain doses, followed by Epsom salts and an enema will be found the most satisfactory routine treatment.

If the urine is not voided the bladder should be catheterized, under rigid asepsis, every eight hours.

The wound is dressed on the tenth day, and, if the convalescence is satisfactory, the patient may sit up on the sixteenth day after operation.

CHAPTER XXIII.

INFECTIONS OF THE FALLOPIAN TUBES AND OVARIES—GENERAL CONSIDERATIONS.

By THOMAS J. WATKINS, M.D.

INFECTIONS of the Fallopian tubes and ovaries is selected as the title of this chapter instead of salpingitis and ovaritis, which is usually employed, as infection represents a disease and inflammation represents the result of nature's efforts to combat an infection. It is an error to consider inflammatory changes as a diseased process, as the tendency of inflammation is to protect and not to destroy tissue. An inflammation may be likened to a fortification. The building of forts mar portions of a country, but they tend to limit the invasion of the enemy and to guard against injury.

Inflammations temporarily or permanently injure organs, but they tend to limit the invasion of bacteria, to confine suppuration within certain boundaries, and probably take an active part in the destruction of bacteria. Another advantage of using the term infection instead of inflammation is that changes inflammatory in character may take place without the presence of bacteria.

Infection of the Fallopian tubes and ovaries is the most important of all gynecological diseases. It produces most of the cases of retroposition of the uterus that are attended by much suffering. It is the chief cause of many of the menstrual disorders and a frequent cause of sterility. It produces more deaths than all of the other gynecological diseases combined. This is the only gynecological disease, except malignant ones, which in itself endangers life to any great extent. Operations for this condition are usually more dangerous than for other gynecological diseases on account of the presence of infectious material and the frequent involvement of other organs, especially the intestines.

It is extremely important on account of the morbidity, as the disease is nearly always attended by much suffering. It produces more suffering in women than all of the other gynecological diseases combined. The morbidity may not be entirely relieved by treatment on account of the presence of adhesions. Infections of the Fallopian tubes and ovaries frequently cause functional and organic disease of other organs from the toxæmia which occurs. Structural changes in the kidneys are especially liable to result.

HISTORY.

The history of inflammation of the Fallopian tubes and ovaries is an extremely interesting subject, and in reading it one is impressed with

the fact that much was known relative to the symptomatology and diagnosis of inflammations of the ovaries and tubes in the early part of the nineteenth century. The gross pathological conditions were observed by many of the French pathologists of that time, especially by Bernutz and Goupil. Puzas was probably the first to recognize the fact that puerperal abscesses generally occurred in the "lateral ligaments" and not in the uterus, but he believed that they resulted from a "metastatic deposit of milk." This theory was adopted by all until the early part of the nineteenth century, when it was "dispelled by the accurate anatomical investigations which characterized the present century."[1]

Dewees in 1840[2] said: "There is rarely any other change in these bodies (the tubes) than that which inflammation produces and they chiefly consist:

"1. In obliteration of the canals of one of them.

"2. In adhesions with the ovary by means of fimbria.

"3. Sometimes in a great distention of one of them from partial development of an ovum."

That these bodies (tubes) are much more frequently inflamed than is generally imagined, we should infer from the number of instances of derangement of structures which the dissection brings to light. We have everything yet to learn as regards the diagnosis of diseased tubes.

Doherty, Churchill[3] and Lever[4] discussed inflammation and abscesses of the ovaries and Fallopian tubes.

Bennet,[5] in 1860, described so well many of the points relative to the pathology, symptomatology, diagnosis, and prognosis of inflammation of the ovaries and Fallopian tubes that we take the liberty to quote him rather extensively.

"Although of late years so much has been written abroad by French pathologists on phlegmonous inflammation of the uterine appendages, there is still an ample field for investigation. Indeed, I may safely say that, notwithstanding all the efforts that have been made to elucidate it, the disease is as yet but very partially understood. This, I believe, is to be attributed to the circumstance that up to the present time it has only been studied in relation to the puerperal condition, with which it is supposed, by the authors I have named, to be nearly always connected; whereas, in reality, it not unfrequently occurs apart from that state. It is now more than ten years since this fact was pointed out to me by M. Gendrin, the eminent Parisian pathologist, and I have since satisfactorily ascertained the correctness of his statement. A careful analysis of all the cases of pelvic inflammation in the female that I have met with, in a rather wide field of observation, enables me to state most positively, from my own experience, that the disease is by no means uncommon in the non-puerperal state, although generally unrecognized and confounded with acute metritis, or iliac abscess. I am not aware that this important fact has hitherto been recognized by

[1] Bennet, Practical Treatise on Inflammation of the Uterus, 1860, fifth American edition.
[2] Diseases of Women.
[3] Dublin Medical Journal, 1843-44.
[4] Guy's Hospital Reports, 1844.
[5] Loc. cit.

any author who has written on the subject in question, the most recent essays on inflammation of the lateral ligaments treating of it as a disease all but peculiar to the puerperal state. Thus, out of 50 cases collected from various sources, and published by M. Marechal de Calvi, whose work represents the present state of science abroad, 49 are puerperal; out of 23 cases quoted by Dr. Churchill, 21 are puerperal; the case of Dr. Doherty is puerperal; so also are the 9 cases of Dr. Lever.

"Owing to inflammation of the uterine appendages having thus been studied only in its severest form—as it occurs in connection with the puerperal state—the peculiar features, which the disease presents in its milder or non-puerperal shape, have not yet been described. Thus it is that this form passes unrecognized."

Thence inflammation of the uterine appendages occurring after parturition presents as great a difference from the same disease in the ordinary state of the system as puerperal metritis offers to the non-puerperal form of that complaint.

In the non-puerperal form, on the contrary, the disease has a tendency to limit itself to the tissues primarily attacked; peritonitis, abdominal perforations, and a fatal termination very rarely occurring.

The non-recognition of the milder form of this disease has been attended with another evil. The less severe cases of puerperal inflammation are often passed over, and extreme cases only observed and recorded, the result being that erroneous impressions become prevalent even with respect to the puerperal form. Thus we find M. Marechal de Calvi giving it as an ascertained fact that the disease is very often fatal, because he finds 13 fatal cases among the 50—in reality exceptional cases—which he has collected. Reasoning on the same fallacious data, he also comes to the conclusion that these abscesses open as often by the abdominal walls as by the rectum or vagina. In both these assertions there can be no doubt that he is quite in the wrong.

In puerperal peritonitis the lateral ligaments are frequently more or less implicated. It is by no means uncommon, in fatal cases of this form of the disease, to find one or both of the ovaries in a state of suppuration, or to meet with abscesses more or less voluminous in the lateral ligaments themselves, or in the walls or cavity of the Fallopian tubes.

Seat.—Inflammation occurring in the region which I have described may attack the cellular tissue alone, or the Fallopian tubes alone, or it may attack all together; in either case the peritoneum may or may not be compromised. Owing to the localization of these organs, to their lying in the same regions, and to their having the same anatomical relations, the symptoms and history of inflammation in them are so similar that it would be difficult, if not impossible, and certainly useless, to attempt to describe them separately. I shall therefore treat of inflammation of the lateral ligaments generally, pointing out as I proceed any difference which may exist and which is really susceptible of being appreciated.

The peritoneal folds themselves are seldom compromised in non-puerperal inflammation of the uterine appendages. When inflammation

occurs in this region after parturition there is a great tendency in the peritoneal membrane to take on the inflammatory action, as is the case when the uterus itself is the seat of inflammation.

"In the unimpregnated non-puerperal condition, on the contrary, there is very little tendency to inflammation in the peritoneum, and the organs contained between its folds may remain inflamed during months or years without the membrane itself being much affected."

The pain is greatest at a little distance from the median line in the right or left ovarian region; more frequently in the latter. Sometimes the tumefaction is perceptible to the eye from the first. If the patient can bear pressure, and the abdominal parietes are not too thick, or too rigid, a deep-seated swelling is frequently perceived in the ovarian region. The presence, however, of these symptoms is seldom sufficiently conclusive to enable the practitioner to distinguish by them alone inflammation of the lateral ligaments from acute metritis.

In order to clear up the doubt, that otherwise must necessarily remain respecting the true nature of the disease, it is indispensable that a careful digital examination should be made. This is, in my opinion, effected most satisfactorily by placing the patient on her back, the knees being elevated or flexed, the forefinger being introduced into the vagina, the elbow should be depressed, so that in penetrating it may adapt itself to the axis of the pelvis. The pulp of the finger may thus be carried underneath and round the cervix, which should be carefully and accurately examined; then by pushing before the finger the cul-de-sac of the vagina, where it is inserted on the cervix, the state of the body of the uterus, of the adjoining pelvic organs, and of the pelvic cavity generally, may be ascertained with extreme accuracy, especially if the left hand is at the same time applied over the lower hypogastric region above the pubis. When this mode of examination is adopted in the healthy female, the bladder being previously emptied, the finger may push the vaginal cul-de-sac before it on the side of the uterus for an inch or two, and can be made to approximate within a very slight distance of the hand applied externally, and that without giving the slightest pain. The practitioner feels with the greatest distinctness that his fingers are only separated from each other by the thickness of the abdominal parietes and by tissues (the lateral ligaments) which present no great density or resistance. When, however, the structures contained between these ligaments—cellular tissues, ovaries, and Fallopian tubes—are inflamed, thickened, and indurated, the state of things is very different. On attempting to push back the vagina on the side of the uterus we find an unusual resistance. The vaginal cul-de-sac has disappeared, and, resting on the side of the cervix and body of the uterus, there is an indurated swelling, very different from the normal condition, and very different also from what obtains on the other or healthy side, supposing disease to exist on one side only, as is most frequently the case. Pressure on the indurated parts is attended with very great pain, and there is a marked increase in the natural heat of the region. On carrying the finger behind the inflamed structures,

while the abdomen is greatly depressed with the left hand, we can ascertain that the inflammatory tumor situated between the hands is movable, and quite distinct from the parietes of the pelvic cavity. This tumor being generally attached, as it were, to the side of the uterus, only constitutes one mass with that organ. Thence it is, no doubt, that inflammation in the lateral ligaments is generally confounded with metritis, even when a digital examination is resorted to and the presence of inflammatory swelling recognized. If, notwithstanding a careful vaginal examination, there are doubts as to the nature and extent of the swelling, the uterus and annexed organs should be digitally examined through the rectum.

Such is the succession of morbid symptoms observable in the milder or non-puerperal forms of inflammation of the uterine appendages. Although often overlooked, owing to ignorance of the pathological facts of which these symptoms are the result, this disease is in reality as easy to recognize and to follow in the evolution of its phenomena as many better-known affections.

Prognosis.—The prognosis of this disease, either under its puerperal or non-puerperal form, cannot be considered imminent as regards the life of the patient, but may be always looked upon as serious with reference to her health for a lengthened period. When it occurs apart from the puerperal state it very seldom terminates fatally; although, as we have seen, it nearly always entails suffering upon the patient for months, and sometimes even for years.

"The reason that inflammation and abscess of the lateral ligaments have hitherto been considered so serious a disease, and described as very frequently fatal, is, as I have stated, that attention has only been directed to exceptional cases, to those which follow parturition, and in which very extensive pelvic suppurations take place, giving rise to external perforations. In this form of the disease, death occasionally occurs; but even under such circumstances it is rare, unless the inflammation assume an extreme and exceptional degree of intensity."

From the following it will be observed that Bennet frequently encountered appendiceal abscesses, but speaks of them as "iliac abscesses."

"It is a singular circumstance, and one worthy of notice that none of the authors who have written on iliac abscess in the female, have given due weight to this very important and rational mode of establishing a correct diagnosis. Many writers do not even attempt to separate the two diseases, unintentionally confounding them in the same description; and those who try to establish the distinction rely on the external examination of the abdominal parietes, and on other symptoms, such as the site of the disease, which is generally on the right side in iliac abscess, retraction of the thigh being often present in that affection, and generally absent in the other disease, etc."

The following illustrates that Bennet recognized cases of infection of the right Fallopian tube from an appendicitis, and infection of the appendix from the tube:

"In some rare instances inflammation may pass from the lateral ligaments to the iliac fossa, and *vice versa*, in which case the symptoms of the two affections would be united.

"Inflammation of the lateral ligament is not only met with in the acute stage; it frequently presents itself to our notice for the first time in a chronic state, having existed unrecognized for a lengthened period. When this is the case the abdominal tenderness, the external swelling, and all the acute symptoms may have disappeared. The symptoms may be merely those of chronic uterine disease, more or less marked with disturbed menstruation, and occasional inflammatory exacerbations. At this stage of the disease an accurate digital examination is the only means of arriving at a correct diagnosis."

Bennet gave a rather complete differential diagnosis between inflammation of the ovaries and tubes—"iliac abscess on the right side"—tubal pregnancy and metritis.

M. Goopta[1] in 1855 reported the conditions of the genital organs as found upon postmortem examination of fifty native Indian women who died from various diseases. This report showed evidences of inflammatory diseases, such as adhesions, strictures, "obliteration of Fallopian tubes," in fifteen of them.

Tyler Smith, apparently from the observation of cases of inflammation of the ovaries and tubes, recognized the infective nature of the disease as he attributed the morbid changes in the ovaries and tubes to leucorrhœa, and these views were often referred to as the "leucorrhœa theory."

Tilt[2] says that "the oviducts are very prone to inflammation, as is clear from the obliteration of the uterine end, and from the frequent obturation of their distal ends, and that they at times suppurate."

Mathews Duncan[3] did much to show the infective nature of the disease, as he advocated that most of the cases resulted from an endometritis.

Bernutz[4] published a tabulated statement of 99 cases of perimetritis with especial regard to the cause of the disease. Of these he considered 43 non-puerperal, 28 blenorrhagic (gonorrhœa), 20 of menstrual origin, and 8 the result of traumatic causes.

In 1872 Noeggerath[5] published an article on "Latent Gonorrhœa." He was the first to observe the important relation of gonorrhœa to infections of the ovaries and tubes. His writings were so far in advance of the medical knowledge of that time that it required many years for the profession to appreciate their importance.

Reports by Tait[6] of the removal of hundreds of suppurative ovaries and tubes did much to convince the profession of the frequency of infections of the ovaries and tubes.

The discovery of bacteria as the cause of inflammation has been the

[1] Bennet, loc. cit.
[2] Hand-book on Uterine Therapeutics, 1869.
[3] Practical Treatise upon Perimetritis and Parametritis.
[4] Transactions of the American Gynecological Society, vol. i. p. 280.
[5] Ibid., 1876.
[6] Diseases of Women.

most important factor in determining the frequency and importance of infections of the Fallopian tubes and ovaries and their relation to pelvic inflammations.

From what has been said and quoted above one must conclude that considerable knowledge of inflammatory diseases of the ovaries and tubes has obtained for the last fifty years, and yet nearly all cases of infections of the Fallopian tubes and ovaries were treated until about twenty years ago as cases of "pelvic cellulitis."

CLASSIFICATION.

The tendency of late is to classify diseases upon an etiological basis. This is the most scientific method. Unfortunately an etiological classification cannot be employed to advantage in infections of the Fallopian tubes and ovaries, because:

1. It is not always possible to determine the bacterium that is causing the infection. It would, upon first thought, seem easy to determine the variety of the infection by examination of discharge from the uterus, as the coincident endometritis, which is usually present, is generally caused by the same bacteria that cause the infection of the tubes and ovaries. It is, however, difficult or impossible except by culture investigation to distinguish between the pathogenic and non-pathogenic bacteria in the vagina and cervix, that are present in cases of endometritis, and in cases of endometritis there is frequently present a large variety of bacteria.

2. The bacteria causing infection of the Fallopian tubes and ovaries frequently disappear from the discharges from the cervix and vagina before the patient appears for treatment for these diseases or the infection may take place without involvement of the vagina or uterus.

3. Even after operation bacteriological examination of exudates in the Fallopian tubes and ovaries frequently fails to determine the variety of the bacterial infection, as in the chronic stage of the disease the exudate in the Fallopian tubes or ovaries is nearly always sterile.

4. Some cases of infection of the Fallopian tubes are due to mixed infection.

5. Very little is known of the anaërobic bacteria that may produce or be present in cases of infections of the tubes and ovaries.

The classification based upon clinical signs and symptoms and pathological anatomy cannot be displaced to advantage by one based upon etiology until more is known of the bacteria that cause infections of the Fallopian tubes and ovaries.

Many of the classifications that are given not only do not tend to simplify, but rather to complicate the subject.

Infections of the Fallopian tubes will be considered before infections of the ovaries, as the tubes are more frequently affected than the ovaries, produce more functional disturbances, and infections of the ovaries is often secondary to infections of the tubes, while infections of the tubes are seldom secondary to infections of the ovaries.

CHAPTER XXIV.

INFECTIONS OF THE FALLOPIAN TUBES.

By THOMAS J. WATKINS, M.D.

The classification of infections of the Fallopian tubes as given here will be based partly upon the clinical signs and symptoms, and partly upon the pathological anatomy, and will consist in the following:

1. Non-puerperal.
   - *a.* Catarrhal.
     - Acute.
     - Chronic.
   - *b.* Purulent.
     - Acute.
     - Chronic.
2. Puerperal.
3. Tuberculous.
4. Salpingitis isthmica nodosa.

Puerperal and non-puerperal infections of the Fallopian tubes are considered separately as the etiology, symptomatology, prognosis, and treatment differ considerably in the two conditions. The pathology is also somewhat unlike in the two diseases, but not enough so to require separate consideration.

Tuberculous infection of the Fallopian tubes is given a separate heading, as it produces more individual characteristics than obtains from infections produced by any of the other bacteria.

Salpingitis isthmica nodosa is usually, if not always, inflammatory in origin. It is considered separately, as it has many individual characteristics, and may occur in puerperal, non-puerperal, or in tuberculous infections of the Fallopian tubes.

One should remember in dividing infections of the Fallopian tubes into catarrhal, purulent, acute, and chronic that one is often enumerating different stages only of the same disease, as catarrhal cases often become purulent and purulent cases may become catarrhal. Acute cases usually become chronic and chronic cases often have acute exacerbations.

Etiology of Non-puerperal Infections of the Fallopian Tubes.—The etiology will be divided into I. predisposing, and II. exciting causes.

I. Predisposing Causes.—The predisposing causes are of much less importance than the exciting causes. It is somewhat difficult to estimate the importance of the predisposing causes, as cases of salpingitis frequently occur in the absence of any appreciable predisposing causes,

and frequently do not occur in the presence of numerous predisposing causes even in cases with endometritis.

The following are the predisposing causes:

1. *The Puerperium.*—Infection reaches the tubes more readily than normal during the puerperium, because the lymphatic circulation between the uterus and vagina and the tubes is very active at this time. In the non-puerperal state infection of the tubes through the lymphatics seldom occurs. During the puerperium the lumen of the interstitial portion of the tube is much increased in size and consequently infection travels very readily from the uterus to the tubes. The congestion and œdema of the tubes of the puerperium also predispose to infection. The involution of the puerperium may diminish the resistance of the tube to infection and thus predispose to infection.

2. *Menstruation.*—Menstruation as a predisposing cause to salpingitis is emphasized by the fact that a very large percentage (probably 50 per cent. or more) of the cases of infection of the tubes date the illness from a menstrual period. The reasons why menstruation acts as a predisposing cause are:

a. The menstrual fluid is an excellent culture medium, especially for gonococci.

b. The mucous membrane of the uterus and tubes is congested, œdematous, and somewhat eroded, and the lymphatics are active at this time.

c. Decomposition of the menstrual fluid in cases of endometritis and vaginitis may predispose to tubal infection.

3. *Pelvic Tumors.*—Pelvic tumors by causing pressure upon the tubes and by producing circulatory disturbances may predispose to infection.

4. *Anomalies of the Tubes.*—Anomalies in the tubes as very long or tortuous ones may predispose to infection. Freund and Rokitansky believe that prominent mucous folds in the tube may cause the secretion of the tube to accumulate and thus predispose to infection. Martin does not believe that tortuous tubes predispose to infection of the tube but are the result of an infection.

5. *Infections of Neighboring Organs.*—Infections of neighboring organs is an important predisposing cause; in fact infection of the tubes is nearly always the result of an extension of an infection from a neighboring organ, as primary infection of the tubes probably never results. Infection of neighboring organs is, however, more of an exciting than a predisposing cause. Nearly every case of non-puerperal salpingitis is due to an extension of an infection of the endometrium. In a few cases a salpingitis of the right tube is the result of an extension of an infection of the vermiform appendix. Pelvic exudates and adhesions involving the intestines predispose to an infection from the intestines.

6. *Chemical substances* and intrauterine manipulations predispose to tubal infection.

7. *Any condition that interferes with the circulation of the tubes* predisposes to infection, such as the presence of tumors, uterine displacements, injuries to the pelvic floor, cardiac lesions, deficient elimination, excessive coitus, etc.

8. *Massage* by its effect upon the circulation and by the separation of old adhesions may predispose to infection.

9. *Ectopic pregnancy* by producing an excellent culture medium, by causing adhesions, and from its circulatory disturbances predisposes to infection of the tubes.

10. *Anything that diminishes the general health*, such as the anæmias, syphilis, nephritis, and the diatheses are predisposing causes.

After all is said relative to predisposing causes in infections of the tube, and after careful study of numerous cases, one must question their actual importance, as salpingitis often occurs without the presence of predisposing causes, and infection frequently does not extend from the vagina and endometrium in vaginitis and endometritis to the tube in the presence of numerous predisposing causes.

II. EXCITING CAUSES.—The exciting causes of infection of the Fallopian tubes are the pathogenic bacteria. The variety of bacteria that have been found to cause salpingitis is numerous. The following list is given by Frank T. Andrews:[1]

A. Animal Parasites.
- *a.* Echinococcus.
- *b.* Blastomyces.
- *c.* Oxyuris vermicularis.
- *d.* Ascaris lumbricoides.

B. Vegetable Parasites.
- *a.* Gonococcus.
- *b.* Streptococcus.
- *c.* Staphylococcus.
- *d.* Pneumococcus.
- *e.* Bacillus coli communis.
- *f.* Typhoid bacillus.
- *g.* Bacillus of malignant œdema.
- *h.* Bacillus of Friedländer.
- *i.* Saprophytes (non-pathogenic).

C. Infectious granulomata.
- *a.* Tubercle bacillus.
- *b.* Virus of syphilis.
- *c.* Actinomyces.

The frequency of infection with the various bacteria and a complete bibliography to date are given by Dr. Andrews.[2]

Most of the cases of salpingitis are caused by the vegetable parasites. The following list as given by Andrews[3] gives an idea of the relative frequency of infection of the Fallopian tubes from the various vegetable parasites.

"As to the accuracy of the examinations, this may be said: In some of the cases only a cover-glass smear was made; in others a cover-glass smear and culture; while in a few animal experiments were resorted to. In some cases when the smear showed nothing the culture or animal

[1] American Journal of Obstetrics, vol. xlix., No. 2. [2] Loc. cit. [3] Loc. cit.

experiment revealed the infecting microbe. Individual differences of technique and skill also exist. The tubercle bacillus is excluded from this table for two reasons: (1) The failure of most authors to include it, and (2) because ordinarily the lesion caused by tuberculosis is not pyosalpinx."[1]

If an accurate bacteriological examination were made of all tubes removed for salpingitis it would even then be impossible to determine with accuracy the relative frequency of infection of the Fallopian tubes with the various bacteria, because:

1. Many of the tubes are free from micro-organisms when removed.
2. In cases of mixed infections some of the varieties of the bacteria may disappear before the examinations are made.
3. Not all cases of salpingitis are operated on, consequently only a portion of the cases can be subjected to a bacteriological examination.

No.		Sterile.	Gonococcus.	Staphylococcus and streptococcus, either or both.	Pneumococcus.	Bacillus coli communis.	Typhoid bacillus	Bacillus malignant œdema.	Pneumobacillus of Friedländer	Saprophytes.	Total.	
1	Charrier	6	9	...	...	...	...	...	...	...	15	
2	Hartman and Morax	13	13	4	2	1	...	...	...	...	33	
3	Kelly	28	8	1	...	...	...	...	...	1	38	
4	Koch	...	...	...	...	...	1*a*	...	...	1*a*	1	*a* = mixed
5	Legros	1	...	...	...	...	...	...	...	...	1	
6	Martin	63	21	7	5	2	...	...	...	11	109	
7	Menge	68	22	5	...	...	...	...	...	2	97	
8	Orthmann	7	1	...	...	...	...	...	...	...	8	
9	Prochownik	5	1	21	...	...	...	...	...	...	27	
10	Reichel	...	1	...	...	...	...	...	...	...	1	
11	Schäffer	10	...	...	...	...	...	...	...	1	11	
12	Schauta	69	23	15	...	1	...	...	...	...	108	
13	Schenk	...	...	...	...	...	...	...	1	...	1	
14	Schmitt	...	1	...	...	...	...	...	...	...	1	
15	Stemann	...	1	...	...	...	...	...	...	...	1	
16	Strassmann	...	...	...	...	...	...	...	...	1	1	
17	Wertheim	5	16	1	...	...	...	...	...	1	23	
18	Westermark	...	1	...	...	...	...	...	...	...	1	
19	Whiteside	9	7	3	1	1	...	...	...	6	27	
20	Witte	15	7	4	4*a*	...	...	1*a*	...	9	39	*a* = 1 mixed
21	Zweifel	32	8	3	1	...	...	...	...	...	44	
22	Rist	3	2	1*a*	...	1*a*	...	...	...	1	7	*a* = mixed
23	Mackenrodt	...	...	1	...	...	...	...	...	...	1	
24	Durck	...	...	1	...	...	...	...	...	...	1	
25	Bellei	5	1	12*a*	...	1	...	...	...	3*a*	20	*a* = 2 mixed
26	Walsh, G.	9	7*a*	5*a*	...	4*a*	...	...	...	4	25	*a* = 7 mixed
27	Frommel	...	...	...	1	...	...	...	...	...	1	
28	Andrews, F. T.	26	5	2	...	7*a*	...	...	...	4*a*	42	*a* = 2 mixed
	Total	374	155	86	14	18	1	1	1	45	684	

Sterile	55.0 per cent.
Only saprophytes	6.0 "
Gonococcus	22.5 "
Staphylococcus and streptococcus	12.0 "
Pneumococcus	2.0 "
Bacillus coli communis	2.5 "

One must be impressed on study of the above table with the difference in the results obtained by the various observers, and must question

[1] Andrews, loc. cit.

whether this difference was real or was due to the use of different methods of investigation.

Frequency of Gonorrhœal Infection.—This table shows that gonococci produced 50 per cent. of all of the cases that contained bacteria. It is conservative to estimate that over 50 per cent. of the "sterile cases" were caused by gonococci, as in many cases of pyosalpinx with sterile pus a positive history of gonorrhœa is given and "residues of gonorrhœa" are found about the vulva and urethra.

Schwartz says that 10 per cent. of all married men have gonorrhœa and that 10 per cent. of the others acquire this infection during married life. Consequently 20 per cent. of all married women must be subjected to gonorrhœal infection.

Noeggerath says that 80 per cent. of all married men have had gonorrhœa, and that 72 per cent. of them have the disease in the chronic form.

Sänger found 230 cases of gonorrhœa in 1930 gynecological cases. In a later observation he found in 161 gynecological cases 18 per cent. of them had gonorrhœa.

Zweifel found in all of his gynecological cases that 11 per cent. had gonorrhœa.

Frequency of Tubal Infection in Gonorrhœa.—Schwartz found in 55 cases of gonorrhœa which he observed for several years that the infection involved the following organs:

Urethra in 91 per cent. of the cases.

Cervix in 74 per cent. of the cases.

Uterus in 14 per cent. of the cases.

Tubes in 3.6 per cent. of the cases.

He subsequently observed 19 other cases of gonorrhœa for a number of years and found the following organs infected:

Urethra 93 per cent. of the cases.

Cervix 70 per cent. of the cases.

Body of the uterus 23 per cent. of the cases.

Fallopian tubes 10 per cent. of the cases.

These investigations show that the tube became infected in 5.5 per cent. of the cases.

Steinschneider found in 100 cases of chronic gonorrhœa symptoms of infection of the cervix in 37 cases, and in 94 cases of gonorrhœa of the cervix the symptoms of tubal involvement in 43 of them.

Martin claims if one determines the etiology of salpingitis by bacteriological examination, gonococci will be found to be the most frequent cause; if by the history, then the majority of cases will be due to other causes. There is no doubt that many patients have a gonorrhœal vulvovaginitis and urethritis without extension of the infection to the endometrium, and that a gonorrhœal infection frequently exists without a salpingitis. It is, however, possible that a salpingitis occurs in some of these cases without being recognized.

Mixed Gonorrhœal Infection.—The question of mixed gonorrhœal infection has not been definitely answered. Wertheim, Menge, and Krönig do not believe in a mixed gonorrhœal infection. Charrier,

Wille, Schmorl, Sänger, and Martin have the opposite opinion. Fritsch does not believe in a mixed gonorrhœal infection of the tubes, but says a gonorrhœal Fallopian tube may be infected with other bacteria, such as staphylococci or colon bacilli, after the gonococci have disappeared. Döderlein is of the same opinion.

Menge and Krönig believe that a gonorrhœal endometritis is often cured by a puerperal streptococcus infection.

It is probably safe to say that a mixed infection of gonococci with other bacteria, except tubercle bacilli, does not persist for a long time.

Routes of Infection in Non-puerperal Salpingitis.—In non-puerperal cases nearly all infections of the tube are the result of extension of an infection from an endometritis by continuity of tissue. Consequently the exciting causes of an endometritis are usually the exciting causes of a salpingitis. (See Etiology of Endometritis.)

Not all cases of endometritis produce salpingitis. Why do some cases of endometritis cause salpingitis and why do others not do so? This has not been positively determined. The probable reasons are:

1. Difference in the variety of infection.
2. Difference in the virulence of infection.
3. Difference in the resistance of the body to infection.
4. Difference in the drainage of the uterus.
5. Difference in the size of the lumen and the mucosa of the interstitial portion of the Fallopian tubes.
6. Difference in the treatment of endometritis.

It is not known what percentage of cases of endometritis have salpingitis. It is known, however, that in a very large percentage of cases of infection of the endometrium the Fallopian tubes escape infection.

Salpingitis occasionally results by infection through the lymphatic vessels, from the vulva, vagina, or uterus.

Infection may result through the bloodvessels. This has been known to occur, for example, in cases of pneumococcus and tuberculous infection.

Infection of the tubes may also occur by contiguity of tissue, as salpingitis may be secondary to oöphoritis, appendicitis, or peritonitis.

Pathology of Non-puerperal and Puerperal Infections of the Fallopian Tubes.—In discussing the pathology of infection of the Fallopian tubes, the following classification will be made in order to simplify the subject:

1. General remarks.
2. Catarrhal Salpingitis—acute and chronic.
3. Purulent Salpingitis—acute and chronic.
4. Hydrosalpinx.
5. Pyosalpinx.
6. Tubo-ovarian cysts and abscesses.

General Remarks.—It should be remembered that a hydrosalpinx is nearly always one of the results of a catarrhal salpingitis, and that a pyosalpinx is one of the results of a purulent salpingitis. The distinction between a hydrosalpinx and catarrhal salpingitis and between a pyosalpinx and a purulent salpingitis is made by the amount of fluid found in the tube and the occlusion of the abdominal ostium of the tube.

Tubo-ovarian cyst is so peculiar in formation that it is considered by itself.

In the early stage of any of the varieties of infections one may find all of the pathological changes of an acute catarrhal salpingitis. Infection of the tube usually takes place in the mucosa, but it may occur in the serosa and subserosa, and in rare instances in the muscularis from embolic infection. An acute catarrhal salpingitis may terminate in complete recovery, in a chronic catarrhal, or a purulent salpingitis. Salpingitis not infrequently exists without assuming an acute form, as it may start and terminate as a subacute or it may pass from a subacute into a chronic salpingitis.

Very little individual attention will be devoted to the pathological changes produced by the different bacteria, as they all cause very much the same pathology. It is seldom possible to determine the variety of the infection, except in cases of tuberculosis or actinomycosis, from the pathological changes without a bacteriological examination. In cases of severe infection with streptococci or staphylococci, necrosis of the superficial portions of the mucosa occasionally occurs and the muscularis is affected early in the disease. With a gonorrhœal infection the inflammatory changes are, for a considerable time, chiefly limited to the mucosa.

When a purulent salpingitis exists in one tube and a catarrhal salpingitis is present in the other tube the infection is usually gonorrhœal. In gonorrhœal infection of the tubes, the chief habitat of the gonococci is in the mucosa and exudate, but they may be found in the connective tissue and serosa of the tube. They may be carried by the lymph or bloodvessels to and produce infections of any of the serous membranes in the body.

Gonorrhœal infection usually produces a large amount of inflammatory tissue and a smaller amount of suppuration. With other bacterial infections liquefaction is more abundant than in gonorrhœal infection. At times, in cases of gonorrhœal salpingitis, portions of the mucosa are not materially disturbed, as is demonstrated by finding portions of the epithelium of the mucosa nearly normal. If offensive pus is found in the tube the presence of colon bacillus infection or saprophytes should be suspected. In chronic afebrile cases of salpingitis bacteria are usually absent. How the bacteria are destroyed has not been positively determined. One theory is that they are killed by toxins produced by themselves. This theory is supported by the fact that bacteria are sometimes found in pus on microscopic examination, when cultures from the pus show it to be sterile.

Metschnikoff says that the bacteria are destroyed by phagocytes. Buchner believes that normal blood serum is a germicide.

Emmerick and Loew contend that bacteria are often destroyed by enzymes, which they themselves produce, and that these enzymes are most abundantly generated by bacteria with high lytic power.

Wassermann[1] found that cultures of gonococci, after destruction of

[1] Berliner klin. Woch., 1897, vol. xxxii.

the bacteria, contain a strong toxin. A very small amount of this toxin, when injected into animals, produces fever, inflammatory products, and swelling of the neighboring lymphatic glands. These findings, he believes, explain how chronic cases of gonorrhœal salpingitis with sterile pus have acute exacerbations.

Noeggerath[1] claimed that gonococci may remain latent in the tissues for a long time and then become active. The truth of this has been abundantly demonstrated.

Sänger has suggested the term residual gonorrhœa. His reason for this nomenclature is that he believes residues of gonorrhœa may last for a long time after the gonococci have been destroyed; that these residues may disappear, may continue without undergoing any appreciable change, or the pathological condition may be progressive. In these cases he believes that the diagnosis can usually be made by the symptoms produced from the coincident and persistent infection of other organs, such as the vulva, urethra, etc.

Catarrhal Salpingitis—Acute and Chronic.—One seldom has an opportunity to study the pathology of acute catarrhal salpingitis, as such tubes are not removed unless they exist as a complication to some disease which requires a cœliotomy.

a. Changes in the Secretion. Amount.—The secretion at first is increased without showing any other pathological changes. Later, the consistency of the exudate becomes thickened by accumulation of mucus.

Color.—In the earliest stages of the disease the exudate is glassy in appearance and afterward it becomes whitish and cloudy; in very acute cases it is often reddish in color. In chronic catarrhal salpingitis the exudate becomes more sticky. In rare cases the exudate looks like yellow vaselin (Martin).[2] In a later stage the thickened exudate may become more fluid, so that it may again appear as a cloudy serous exudate, containing a few fibrinous masses or granular flakes. The color and consistency depends upon the relative amount of serum, mucus, and red and white blood cells which are present in the secretion.

In acute febrile cases bacteria are nearly always present. In the chronic afebrile cases bacteria are seldom found.

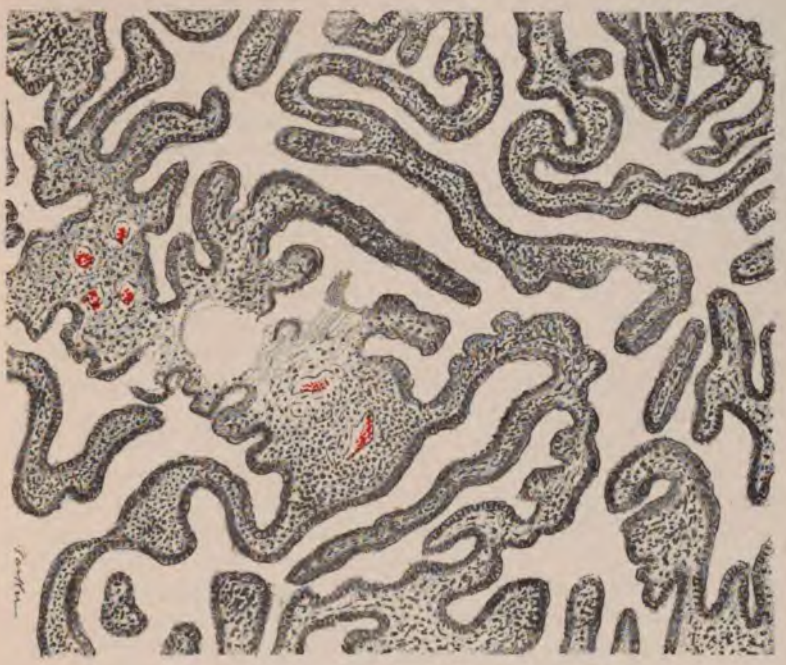
Histology of the Exudate.—In the exudate are found mono- or polynuclear leukocytes, sometimes erythrocytes, fatty degenerated round cells, epithelium, and blood pigment. In the more chronic stages of the disease mucin, hyalin, and fatty degenerated cylindrical epithelium are present. Some of the epithelium may retain their ciliary fibres. At times the epithelial cells are found more cubical or like cup-cells. There also appears fibrinous precipitates, fatty detritus, hæmoglobin precipitates, and cholesterin. The reaction changes from the normal alkaline to neutral or acid. On chemical examination mucin, hyalin, and even colloid are found in the exudate.

[1] Transactions of the American Gynecological Society, 1876.

[2] Krankheiten der Eileiter, 1895, p. 138.

PLATE XLV.

FIG. 1.



Catarrhal Salpingitis.

FIG 2.

Chronic Salpingitis.

Folds increased in size and number. Marked round-cell infiltration.

b. Changes in the Mucosa.—In acute catarrhal salpingitis the mucosa is the portion of the tube most affected, and consequently this condition is at times called an endosalpingitis.

The mucosa becomes much swollen, especially in the pars ampullaris. The fimbriæ have a deep-red color like a cock's comb and project out of the lumen of the tube like a fungus mass. On cross-section, the swollen folds of the mucosa fill tightly the whole lumen of the tube, and pressure on the tube causes an exudate to appear at the ostium.

In the early stage the capillaries near the epithelium are hyperæmic and the whole mucosa is thickened by hyperæmia and œdema. In the connective tissue of the mucosa an infiltration can now be detected with round cells, which spreads out over the whole mucosa and especially over the folds of the mucosa, which makes them appear club-shaped. At this time the epithelial covering may be found nearly intact, but somewhat flattened by pressure, so that the epithelium may appear cubical rather than cylindrical in shape. The ciliary fibres, however, may at times be found intact, especially between the folds of the mucosa. (Williams).[1] Small hemorrhages in the mucosa are found in severe cases of catarrhal salpingitis.

Chronic catarrhal salpingitis shows about the same changes as the acute, only increased in amount. The round-cell infiltration, œdema, and hyperplasia cause the folds of the mucosa to increase in size and number.[2] The mucous folds increase in size so that those on opposite sides of the tube are pressed against each other. At the points of contact pressure causes the epithelium to become injured or destroyed. The epithelium is also injured or destroyed by separation of the cells from round-cell infiltration and œdema. After the folds are deprived of their epithelial covering in places the connective tissue of the opposite folds grow together and thus form connective-tissue bridges, which go in every direction like partitions from one side of the tube to the other.[3]

In far-advanced cases the whole lumen of the tube may thus become partly obliterated. By agglutination of the folds laterally or at their apices portions of the mucosa deep between the folds are converted into cavities lined with epithelium, which upon superficial examination could be mistaken for glands.[4]

The fate of these cavities varies, either they become compressed by round-cell infiltration and disappear, or they are separated by the inflammatory process completely from the lumen of the tube with which they communicated in the beginning. It is easily demonstrated on serial sections that they thus become real cysts lined with epithelium. If the epithelial lining in these cysts is well preserved its secretion may dilate them. Being enlarged they may even be found in the muscular layer, or they may become united by atrophy of partition walls, and thus form larger cysts. The epithelium is flattened by the pressure of

[1] The British Medical Journal, 1891, vol i. p. 101.
[2] Salping. Catarrh. Vegetante of Cornils. Arch. de physiol. norm. et pathologique, 3 Ser. p. 529.
[3] Kleinhaus. Veit's Handbuch. Krankheiten der Tuben, 1897.
[4] Williams and Ballantyne, loc. cit. Bland Sutton.

the exudate and by the growth of the cysts. On microscopic examination under low power such a tube appears to be perforated in many places. This form is called by Martin salpingitis pseudofollicularis, as the normal tube does not contain the above-described follicles. In rare instances these translucent cysts lined with flat epithelium are so numerous that they form a layer in the mucosa.

Bode[1] reports 1 case of ulcers in simple catarrhal salpingitis.

In very chronic cases calcareous precipitates are infrequently found.

c. Changes in the Musculature.—In acute catarrhal salpingitis the muscular layer shows hyperæmia and œdema, and in very acute and severe cases, round-cell infiltration, especially along the vessels. In the more subacute or chronic catarrhal salpingitis the thickening of the muscular layer is pronounced. The round-cell infiltration, which at the beginning is only along the vessels, extends along the perimysium and then along the whole muscular wall. The muscle fibres become hypertrophic, the connective tissue between them hyperplastic, and thus produce a thickening of the wall of the tubes. The hyperplasia of the connective tissue predominates over the hypertrophy of the muscles in most of the cases. Instances of special hypertrophy and hyperplasia are called salpingitis interstitialis diffusa or myosalpingitis productiva.[2] Hyaline degeneration of the connective tissue occurs quite often.

In chronic catarrhal salpingitis the bloodvessels are not only dilated, but also show extensive thickening of their walls, which extend over the intima and adventitia. Sometimes hyaline degeneration in the wall is found and ectasia of the capillaries exists.

The round-cell infiltration of the entire wall may change into scar-like tissue, which causes the whole tube to look atrophic and sclerotic.[3]

d. Changes in the Serosa.—In acute cases the serosa and the subserous tissue show hyperæmia and œdema, and at times, but infrequently, thin fibrinous membranes (precipitates).

In the chronic stage of the disease the vessels of the subserosa are dilated, round-cell infiltration occurs, and the peritoneum is covered with fibrinous precipitates, which later on become organized and produce adhesions with other parts of the tube, with the pelvic or parietal peritoneum, or with the peritoneum of other organs, such as the intestines, the uterus, the bladder, the omentum, or with the ovary.

The whole tube is swollen so that it increases in thickness and length, and it becomes more tortuous, for the mesosalpinx does not increase in length, as do the mucosa and serosa of the tube.

e. The Most Important Changes are at the Abdominal and Uterine Ostia of the Tube.—The mechanism of the occlusion will be discussed under the pathology of Purulent Salpingitis, as the process is nearly the same in the two diseases.

[1] Centralblatt f. Gynäk., 1889, p. 160.

[2] Orth. Lehrbuch der pathol. Anatomie., 18 ys Sawinoff Arch. f. Gyn., Bd. xxxiv. p. 239.

[3] Boldt. Interstitial Salpingitis. American Journal of Obstetrics and Diseases of Women and Children, February, 1888.

PLATE XLVI.

Figure 1[1]. *a.* Salpingitis Catarrhalis Hemorrhagica, Cross-section. *m.* Muscle of the tube. *n.* Mucosa of the tube. *l.* Lumen of the tube. Picrocarmine stain. (Hartnack, Oc. 2; Objective 4.) *b.* Leucocytes containing blood pigment with normal red blood-corpuscles from the tubal mucosa. (Harnack, Oc. 2; Objective 7.)

Figure 2. Salpingitis Purulenta Acuta Dextra. *ou.* Uterine opening of tube. *oa.* Abdominal end of tube. *ov.* Right ovary. *f.* Purulofibrinous deposit. Posterior view, natural size.

Figure 3. Salpingitis Purulenta Chronica Dextra. *ou.* Uterine end of tube. *oa.* Region of abdominal end of tube. *ov.* Ovary with strongly adherent tube. Posterior view, natural size.

[1] August Martin, Krankheilen der Eileiter.

PURULENT SALPINGITIS—ACUTE AND CHRONIC. *a. Changes in the Secretion.*—The exudate contains many pus cells, and in acute cases nearly always bacteria.

The consistency of the exudate may be thin fluid pus, or it may be thick, creamy, or cheesy in character, or it may be flocculent, depending to a certain extent upon the duration of the disease and the variety and virulence of the infection. The color of the pus will vary according to the relative amount of pus cells, red blood cells, mucus, and degenerated tissue.

b. Changes in the Mucosa.—All of the pathological changes described in acute catarrhal salpingitis are found exaggerated in purulent salpingitis. In the acute stage the mucosa, especially in the ampullar portion, is enormously hyperæmic. The fimbriæ are thickened, hyperæmic, and œdematous, and project out of the ostium abdominale as large red protuberances. Pus is found between the fimbriæ. On cross-section the whole lumen of the tube is tightly filled with the swollen folds of the mucosa, which are deep red in color, œdematous, and covered with pus.

If the disease passes into the chronic stage the swelling of the mucosa disappears slowly, the folds of the mucosa project less into the lumen, become smaller and smaller, and often contain small cysts. They gradually get lower and lower, partly by pressure of the exudate in the tubal canal, and the lumen of the tube becomes larger and larger. Cases which do not show an acute stage in a clinical sense have the same pathology, but in a lesser degree.

Microscopic examination in the acute stage of the disease shows an enormous round-cell infiltration and dilated lymph and bloodvessels. The changes produced by the inflammation always begin on the top of the mucous folds. The epithelium is cast off in many places. In very chronic cases, however, normal epithelium even with ciliary fibres may at times be found deep between the folds of the mucosa. This illustrates the great amount of resistance which the epithelium possesses to the infection.

The denuded portions of the mucous folds grow together and produce bands, cysts, and pseudofollicles, as described under catarrhal salpingitis. By permanent and complete agglutination of folds of the mucosa separate abscesses are formed (salpingitis purulenta saccata).

In very chronic cases of purulent salpingitis ulcers of the mucous membrane have been observed.[1]

c. Changes in the Musculature.—Hyperæmia, œdema, and round-cell infiltration occur early in the disease along the blood and lymph vessels, and later over the whole tubal wall.

Hypertrophy of the muscle fibres and hyperplasia of the connective tissue produce, in connection with the round-cell infiltration, an enormous thickening of the wall of the tube up to one-half inch. Afterward the muscular layer becomes thin, but this will be discussed under

[1] Zweifel. Arch f. Gynäkol., 1891, S. 358.

Pyosalpinx. The thickness and stiffness of the tubal wall is the most striking symptom of this stage.

In rare cases the round-cell infiltration accumulate in certain spots, and produce abscesses in the wall of the tube (salpingitis interstitialis disseminata).

d. Changes in the Serosa.—The serosa in acute purulent salpingitis is enormously hyperæmic and œdematous. It loses its lustre, is frequently covered with fibrinous membranes, and occasionally with pus, depending upon the presence or absence of a surrounding peritonitis. The vessels in the subserosa are especially dilated, and their surroundings are the seat of an extensive round-cell infiltration. The fibrinous membranes when present become organized into connective tissue in the chronic stage of the disease and produce adhesions between different portions of the tube and ovary and other organs, such as the intestines, appendix, omentum, the uterus, the pelvic peritoneum, etc. The ovary and tube may thus form one mass. Adhesions are of frequent occurrence on the lateral and posterior wall of the tube, but rarely involve the anterior tubal wall. Adhesions may extend from one to the other tube, and they may even spread out over all the pelvic organs so that the pelvic organs appear as one mass.

Ulceration may occur in the mucosa of the tube in chronic purulent salpingitis, and the ulceration may extend through the tubal wall and may even extend through the wall of an adherent viscus or through the abdominal wall, and thus the pus may escape into the peritoneum, the vagina, bladder, or intestine, or through the abdominal wall. Perisalpingitic abscesses may also be formed by infection of the surrounding peritoneum.

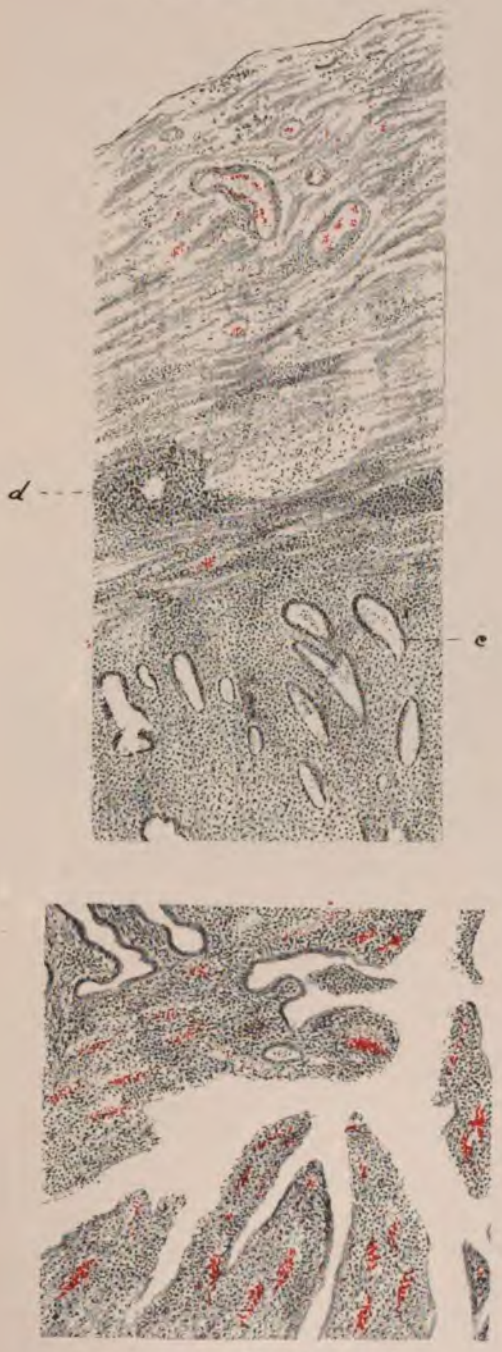
e. Changes in the Proximal and Distal Ends of the Tube.—In purulent as in catarrhal salpingitis the pars ampullaris is the portion of the tube most affected in the early stage of the disease. But more important than this are the changes which produce occlusion of the ostia of the tube, which has given rise to a literature of its own. The abdominal ostium of the tube becomes occluded by one of two methods, as follows:

1. Annular constriction of the end of the tube.

2. Agglutination of the abdominal end of the tube to the ovary, to the pelvic peritoneum, or the peritoneum of the intestines, uterus, or omentum. The agglutination occurs more often to the peritoneum in Douglas' cul-de-sac than elsewhere, as infection of the tube increases its weight and its increased weight usually causes the free end of the tube to gravitate into the rectouterine pouch. In this method of occlusion the infected secretion of the tube exudes through the abdominal ostium and produces an inflammatory process about the ostium and of the peritoneum which is in contact with it. This results in the formation of an inflammatory exudate between the end of the tube and the peritoneum in contact with it, and thus produces complete occlusion of the abdominal ostium of the tube.

There are various theories of the mechanism of occlusion by annular constriction, and possibly this method of occlusion occurs in different ways.

PLATE XLVII.



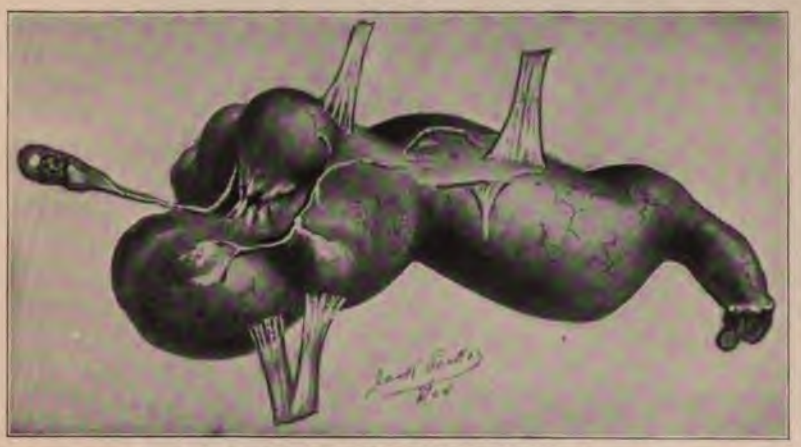
Purulent Salpingitis.

Muscularis very much thickened. Marked congestion, with hemorrhage under the serosa. Folds much swollen, hyperemic, with destruction of epithelium.

Rosthorn[1] says that occlusion by annular constriction occurs by inversion of the fimbriæ into the tube, and that the inversion is the result of connective tissue which is formed as described above under Changes in the Mucosa. The connective tissue by cicatrization draws the fimbriæ into the lumen of the tube, where they usually become adherent to the mucosa of the tube.

Pseudomembranes are formed over the base of the fimbriæ and thus complete the occlusion of the opening. This theory is also described by Orth and Martin. The fimbriæ may be retracted into the lumen of the tube without adhesions occurring between the fimbriæ and the tubal mucosa, so that the distal end of the fimbriæ may be left more or less free inside the tube. The exudate in the tube will in this condition press the fimbriæ against the tubal wall, and thus give the appear-

FIG. 276



Pyosalpinx with adhesions; ray-shaped scar at site of the occluded abdominal ostium; small cyst attached near abdominal end of tube.

ance of a "rosette." On the outside of the tube in this case a ray-shaped scar often can be seen in the place of the ostium (Fig. 276).

The cicatricial contraction may be principally confined to the abdominal end of the tube or it may affect the entire mucosa of the tube, which would make the mucous coat relatively shorter than the other coats of the tube, and would invert the fimbriæ into the lumen of the tube.

Doran[2] and Kleinhans[3] are of the opinion that occlusion of the abdominal ostium due to annular constriction is chiefly the result of a projection of the outer ends of the muscular and serous coats over the fimbriæ—that is, the inflammation elongates the muscular and serous coats so much more than the mucous coat, that finally the serous coats come into apposition and become agglutinated at a point beyond the

[1] Beiträge f. Chirurgie, 1892.
[2] London Obstetric Transactions, December 4, 1889.
[3] Veit's Handbuch.

fimbriæ. Kleinhans believes that he has seen several specimens that illustrate this method of occlusion of the abdominal ostium. Kleinhans has in two cases and Zedel[1] in one case seen occlusion of the abdominal ostium from cysts.

Rokitansky says that the abdominal end of the tube is most commonly occluded by agglutination of the fimbriæ to the peritoneum. Klebs says the occlusion is either a process of shrinking, of strangulation, or of inversion of the fimbriæ. In rare cases the occlusion is caused by pressure from a tumor. Doran says that the mechanism of the occlusion depends upon the location of the chief primary lesion. If this is a salpingitis, the method of obstruction is an annular constriction of the abdominal end of the tube. If the chief primary lesion is a perisalpingitis, the method of occlusion is by agglutination of the fimbriæ to some adjacent structure. On separation of these adhesions in cases of occlusion by agglutination the fimbriæ can be seen.

The uterine ostium is sometimes constricted, but seldom occluded. The obstruction is principally mechanical, either produced by swelling of the mucosa or by bending of the tube. Constriction of the uterine ostium may occur as it would in any portion of the tubal canal by the formation of bands, but band formations are less liable to occur in the isthmic and interstitial portions than in any other parts of the tube, because of the difference in the size and number of mucous folds in the different portions of the tube. Rosthorn reports a case of complete occlusion of the uterine ostium and considers the pathological changes the same as in urethral strictures in the male. The following experiments are interesting and instructive:

Kehrer[2] believes that he demonstrated by experiments that occlusion of the abdominal ostium is not sufficient to produce a hydrosalpinx, but that a pathological secretion of the mucosa is necessary to cause it. Landau,[3] however, concluded upon experimentation that the normal secretion of the tube will produce a hydrosalpinx if the abdominal ostium is occluded, but Landau's experiments vary so much in results that their value is questionable. Woskressensky[4] found by experiments that ligature of the uterine end of the tube never produced hydrosalpinx, but that ligature of the abdominal end of the tube did usually produce it. Domaschewitch obtained the same results. Josephson[5] agrees with Landau. Rosthorn[6] failed by injecting microbes into the Fallopian tubes of dogs to produce pathological changes if the mucosa was not injured before the injection was made.

HYDROSALPINX (SACTOSALPINX SEROSA).—A hydrosalpinx is usually the sequence of a catarrhal salpingitis. The abdominal ostium is always occluded and the occlusion is generally by "annular constriction." The uterine ostium is generally diminished in size, but not com-

[1] Arch. f. Gynäkol., 1891, S. 353.
[2] Beitr. zur klin. Experim. Geburtskunde and Gynäk., 1892, p.282.
[3] Arch. f. Gynäk. Bd. xxxix. and xl. p. 1.
[4] Centralbl. f. Gynäk., 1891, p. 849.
[5] Centralbl. f. Gyn., 1893, p. 901.
[6] Loc. cit., Verh. d. deut. ges. f. geb. and gyn., VI. Kongress.

pletely occluded. Pressure on the hydrosalpinx will usually force fluid through the uterine ostium, and microscopic examination will nearly always find the uterine ostium open.

The accumulation of fluid commences in the pars ampullaris. If the hydrosalpinx is not large the tube is apt to be tortuous, elongated, and the tubal walls are increased in thickness. Freund[1] believes that

FIG. 277

Photograph of a hydrosalpinx. Inflammatory node here shown was in the interstitial portion of the tube and was excised out of the uterine cornu. The ovary is seen in the concavity of the tube.

the tortuous tube is an etiological factor in hydrosalpinx, but we believe with Gebhard[2] that the irregular shape of the tube is largely the result of secondary changes in the tube. As the size of the hydrosalpinx increases, the tube becomes straightened, but even in cases of large hydrosalpinx one curve remains in the tube near the ampullar portion

[1] Volkm. Vortr., Nr. 323.

[2] Pathologische anatomie der weibl. Sexualorgane, 1899, p. 433.

which gives the tube the shape of a retort. The ovary is usually found in the concavity of the hydrosalpinx and adherent to it.

Changes in the Secretion.—The contents of a hydrosalpinx is always thin, is of low specific gravity, 1005 to 1010, and looks like clear blood serum. The fluid may be colored from a slight hemorrhage into the tube. The fluid contains albumin, a few leukocytes, and degenerated epithelium, and may contain erythrocytes. The tube may also contain fibrin, granular debris, precipitates of hæmoglobin, and in rare instances cholesterin. The reaction is neutral or alkaline.

If there is much blood present the condition is called a hæmatosalpinx. The blood in these cases does not coagulate, which is an important differential point in the diagnosis of tubal pregnancy, as in tubal pregnancy the blood is usually coagulated. Hemorrhage into a hydrosalpinx may occur from torsion of the tube or from trauma.

Hydrosalpinx may be unilateral or bilateral, but is usually bilateral. Hydrosalpinx is usually adherent, but may be free from adhesions. The adhesions are usually not so numerous or strong in hydrosalpinx as in pyosalpinx. Hydrosalpinx shows no inclination to perforate into other organs. The size of the tube varies from a slight increase from the normal tube to one some inches in diameter. A hydrosalpinx, however, is seldom more than three inches in diameter.

Microscopic Examination.—Mucosa. The changes at first are those of a catarrhal inflammation. As the secretion in the tube increases and the abdominal ostium becomes closed, the mucosa gets thinner, becomes smooth and glistening. The folds in the mucosa frequently disappear and ridges only remain where the tube is tortuous. These ridges give the tube an appearance, on longitudinal section, of being divided into sections by annular constrictions. Some of the higher folds give a warty appearance and simulate papillary excrescences (Rokitansky).

The epithelium also becomes more flattened from pressure and this change may be so marked as to make it appear like endothelium. Deep between some of the folds, however, there may be so little pressure upon the epithelium that normal cylindrical ciliated epithelium may be found.[1]

The Musculature.—The musculature usually becomes very much thinner than normal. Muscular tissue at times almost entirely disappears, but by Van Gieson's method of staining some muscle fibres can always be found.

Infrequently osteoid or calcareous plates are found in the tubal wall. At times the pars ampullaris is the only portion of the tube that is dilated. In these cases the other parts of the tube are usually thickened.

Serosa.—The abdominal ostium is closed as before described. Pseudomembranes and adhesions are found as described under the pathology of Purulent Salpingitis, but in places portions of the serosa remain perfectly smooth.

[1] Gebhard, loc. cit.

PLATE XLVIII.

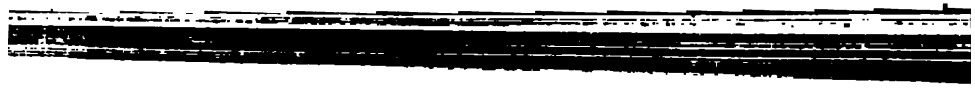
Pyosalpinx.

a. Section of wall.

b. Cross-section through lumen, showing folds diminished in number, thickened by round-cell infiltration, and epithelium destroyed except deep between the folds.

c. Pseudocysts.

d. Small abscess with circumscribed round-cell infiltration.



Bacterial infection may occur in a hydrosalpinx and produce a pyosalpinx. Torsion of the tube, sufficient to affect its vitality, seldom occurs, but a few such cases are reported. The mesosalpinx and adhesions tend to prevent the occurrence of such torsions.

Zweifel and Bland Sutton believe that a pyosalpinx occasionally changes into a hydrosalpinx. Bland Sutton bases his opinion upon cases where he found pus in the isthmic and serum in the ampullar portions of the tube, and a hydrosalpinx in one and pyosalpinx in the other tube.

Menge[1] is of the opinion that hydrosalpinx may occasionally result without the presence of a bacterial infection, but we believe that this does not occur.

Rosthorn and Menge believe that a hydrosalpinx is usually produced by streptococci of low virulence; that they then produce a serous exudate, as they occasionally produce in the pleural cavity a serous pleuritic exudate. It is also possible for streptococci to extend from the endometrium through the lymphatic vessels to the pelvic peritoneum and produce occlusion of the abdominal end of the tube without infecting the other portions of the tube. Rosthorn believes that in cases of hydrosalpinx the pelvic peritoneum is always primarily affected. Menge believes that gonococci do not produce hydrosalpinx, as their product is always pus. Wertheim, however, has recently reported a case of hydrosalpinx which contained gonococci. Menge says, however, that it is possible after the suppurative stage of a gonorrhœal salpingitis is passed for the abdominal end of the tube to become occluded and for a hydrosalpinx to result. Kleinhans found in 11 out of 15 cases of hydrosalpinx, which he observed, the cause to be a puerperal infection. Tumors were absent in all the cases. In 2 of the cases gonococci were found in the cervix uteri. In 2 of the cases no cause could be found.

PYOSALPINX (SACTOSALPINX PURULENTA). *a. The Secretion.*—The tube is filled with pus, but the pus may vary in character, depending upon the relative amount of pus cells, serum, mucus, degenerated tissue or cells, and red blood corpuscles. The presence of a large number of pus cells and degenerated cells with a small amount of serum will cause the contents of the tube to appear cheesy in character. The pus cells may become sedimented so that the greater part of the contents of the tube is serum and then will appear as a thin, slightly discolored fluid. This change has given rise to the belief that a pyosalpinx may become a hydrosalpinx.

A large amount of mucus in the tube will make the contents viscid. Blood cells may be present in sufficient quantity to color the pus. Calcareous precipitates and cholesterin are sometimes found.

On microscopic examination of the secretion, pus cells, more or less degenerated, fibrin, broken-down epithelium, and granular debris will be found. If the pus is examined in the febrile stage of the disease

[1] Zeitsch. f. Gyn. and geb., 1891, p. 119.

bacteria will nearly always be found, and if the pus is examined in the afebrile stage of the disease bacteria will usually be absent.

b. Changes in the Mucosa.—The epithelium is usually destroyed except in places deep between the mucous folds, and granulation tissue is often found on the sites which have been denuded of epithelium, and thus the mucosa may give the appearance of an abscess wall. The granulation tissue may change into scar tissue and then portions of the abscess will be smooth and glistening.

Small nodules may be found due to circumscribed round-cell infiltration, to the formation of small cysts, or to small abscesses which may be mistaken, upon superficial examination, for tubercles.

Stein found in two cases of gonorrhœal salpingitis and in two cases of tuberculosis of the tube proliferation of the epithelium of the mucosa extending into the musculature of the tube. He also found small glandular cysts lined with cuboid-shaped epithelium. He found in some cases papillary excrescences and solid columns of epithelial cells. He believes some of these formations, but not all of them, are due to the same processes which produce pseudofollicular salpingitis. Martin is of the opinion that some of these changes are the result of proliferation of cells in these cysts, a proliferation that always occurs if epithelium becomes separated from its own soil.

Wiegert and Roux claim that these changes are caused by the development of adenomas.

c. Changes in the Musculature.—The muscles in the wall of a pyosalpinx are usually much thickened, and the amount of thickening is more or less proportionate to the amount of pus in the tube. With a small amount of pus the tubal wall is generally very thick and with a large pyosalpinx the tubal wall is, as a rule, rather thin. At rare intervals the tubal wall of a pyosalpinx is as thin as the wall of a hydrosalpinx, and it is in these cases that Martin considers them due to an infected hydrosalpinx.

The thickened wall is due to:

1. Muscular hypertrophy.
2. Connective-tissue hyperplasia.
3. Round-cell infiltration.
4. Œdema of all the tissues and dilatation of the blood and lymph vessels.

d. Changes in the Serosa.—The changes in the serosa are much the same as described under Salpingitis Purulenta. Perforations may occur in other organs and infection may produce abscesses outside of the tube (perisalpingitic abscesses). A minute perforation of the tubal wall may cause a large amount of inflammatory exudate. The abscess outside of the tube may become very large and then it is classified as a pelvic abscess.

The size of a pyosalpinx may vary from a tube a little larger than normal to one two or three inches in diameter. A pyosalpinx, however, is usually not more than two inches in diameter. The ovary is so frequently and completely involved in chronic cases of infection of

PLATE XLIX.

Pyosalpinx.

a. Pseudofollicles in the wall of the tube.
b. Folds and epithelium replaced by granulation tissue.

PLATE L.

Pyosalpinx. Cooper's luteal abscess.

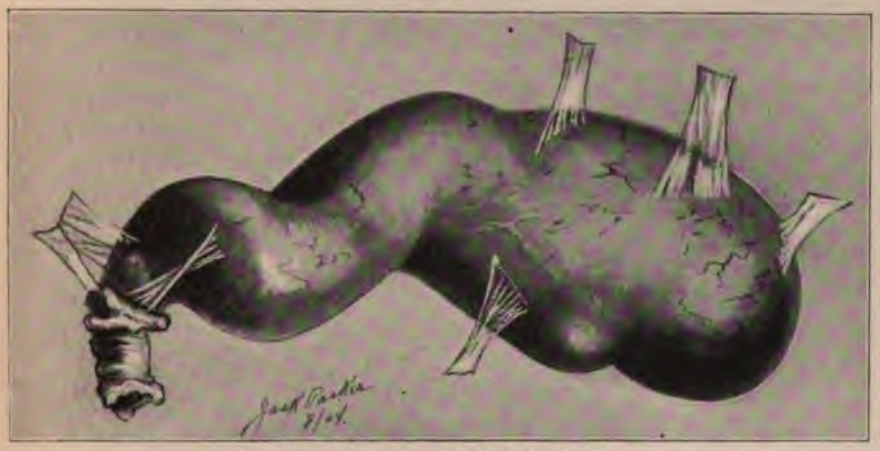
the Fallopian tubes that it is usual for the two organs to appear as one mass of inflammatory exudate.

TUBO-OVARIAN CYSTS AND ABSCESSES.—This term has been given to cases where the lumen of the tube communicates with a cavity in the ovary, or with a part of the ovarian surface.

Blasius was the first to describe this condition. How this condition is produced has not been definitely determined. The following theories have been advocated:

a. The Ovulation Theory of Richart.[1] The abdominal ostium of the tube grasps the portion of the ovary that contains the maturing follicle in order to receive the ovum. By a pathological process the normal involution of the follicles does not occur and the edges of the follicle become agglutinated to the tubal wall.

FIG. 278



Large pyosalpinx with few adhesions.

b. Corpus Luteum Theory of Rokitansky.—He believes that a cystic degeneration occurs in the corpus luteum, that the cyst becomes adherent to the tube, and by atrophy and rupture of the septum a communication occurs between the ovarian cyst and tubal canal.

c. Catarrhal Theory of Veit.—Veit believes that the primary cause is a catarrhal inflammation of the tube, which produces tubo-ovarian adhesions and inflammatory cysts in the ovary, which finally communicates with the lumen of the tube.

d. Burnier's Theory.—Burnier believes that tubo-ovarian cysts are formed by agglutination of a hydrosalpinx to an ovary. The place of adhesion prevents rupture of a mature follicle at that point and causes the follicle to become cystic. Communication may then take place between the cyst and tube by pressure atrophy. Later on some of the fimbriæ may be drawn into the follicle.

[1] Cited from Veit's Handbuch.

e. Theory of a Congenital Condition.—Schneidemühl and Beaucamp are of the opinion that the condition is the result of an abnormal fetal development.

f. Schramm and Neelsen's Theory.—Schramm and Neelsen believe that in cases of tubo-ovarian cysts the cyst wall is produced entirely by the tube and that the ovary is only very closely adherent to the cyst wall, but that by extension and pressure this thin wall may atrophy and some cystic follicle of the ovary may perforate into the sac. Gottschalk demonstrated anatomical specimens of tubo-ovarian cysts where the ovary formed one big cyst and proved that Schramm and Neelsen's theory is wrong, at least for many cases. Zahn's theory is similar to

FIG. 279

A very large tubo-ovarian abscess.

that of Schramm. He believes that the ovary forms only a small and minor part of the wall of the cyst. The ovary is, in these cases, apparently enclosed in the cyst formed by the tube and covered from parts of the tube wall, which he often found outside of the ovarian tissue.

g. Doran's Theory.—Doran says that the formation of pseudomembranes from inflammation is the most important etiological factor of tubo-ovarian cysts; that the tube and ovary become primarily adherent to each other by the deposit of an inflammatory exudate; that in early cases this line of union can be seen on cross-section; that later the round-cell infiltration disappears and that tissues of one organ then fuses into those of the other organ.

PLATE LI.

Tubo-ovarian Cyst. Four different views.

h. Rosthorn's Theories.—Rosthorn[1] gives the following theories:

1. A pyosalpinx may become adherent to an ovary by perisalpingitis and perioöphoritis and cause infection of the ovary and produce an ovarian abscess; perforation of the septum between the two abscesses forms a tubo-ovarian abscess.

2. The infection may take place primarily in the ovary or in an ovarian cyst and may produce an ovarian abscess; may extend to the tube and cause occlusion of the abdominal ostium of the tube. Pyosalpinx and perforation of the dividing septum completes the formation of a tubo-ovarian abscess.

3. A tubo-ovarian cyst may occur from the union of a papillomatous cystoma of the ovary with a sactosalpinx and perforation of the septum by papillary excrescences.

4. Hydrops tubæ may come in communication with a hydrops follicle and form a tubo-ovarian cyst.

Zedel[2] reports a case of purulent salpingitis where the fimbriæ of the tube were found in a large cyst that was entirely separated from the ovary, and on close examination the cyst was found to be due to peritoneal adhesions (peritoneal cyst).

Symptomatology of Non-puerperal Infection of the Fallopian Tubes.—The symptoms are not always proportionate to the pathological changes, as the symptoms may be severe when there is very little change in the tissue. On the contrary the pelvis may be nearly filled with inflammatory exudate and suppuration without causing sufficient disturbance to keep the patient in bed. The detailed consideration of this frequent disproportion between the pathological changes and the symptomatology will not be given here as it will have to be treated under the various symptoms.

The symptoms vary more with the virulence than with the variety of the infection, for example:

With a gonorrhœal infection the symptoms may vary from slight pelvic distress to the most severe symptoms which result from pelvic suppuration, general peritonitis, septicæmia, and death. It is probably true that none of the bacteria that infect the tube vary so much in the symptoms produced as do the gonococci.

With all forms of bacterial infection the symptoms may vary from a slight disturbance to a severe disease.

From what has been said, the conclusion can be made that as regards the symptomatology it is not usually of great importance to determine the variety of the infection.

The gonorrhœal infection is more prone than the other bacterial infections to produce repeated attacks of pelvic peritonitis and to result in chronic symptoms on account of their ability to live in the tissue for weeks and months.

A streptococcus infection is more likely to produce severe symptoms than a colon bacillus or a staphylococcus infection.

[1] Ver. d. Deut. ges. f. geb. and Gyn., VI. Kongress.
[2] Zeitsch. f. Geb. and Gyn., 1894, Bd. xxviii.

It is impossible to determine how much the symptoms depend upon resistance of the tissue to the infection on account of the varying virulence of the infection. It is never possible to determine in two cases the exact relation of the virulence of the infection and the resistance of the tissue to the infection in the human being. In animal experimentation, however, this can be determined with a relative amount of accuracy by noting the symptoms produced from inoculation of two animals under similar conditions with the same infective matter in equal amounts.

It is safe to conclude that usually the symptoms will be more severe when the infection occurs in a weakly and poorly nourished person than in a strong, well-nourished individual. The condition of the blood probably determines more than anything else the resistance to the infection. The more anæmic the patient the less the resistance to the infection as the probable result of diminution in alexines, phagocytes, etc. The distribution of the infection is limited by occlusion of the abdominal ostia of the Fallopian tubes by a previous infection, as the closed tube tends to prevent escape of the infection into the peritoneal cavity and consequently tends to prevent peritonitis.

The symptoms will vary somewhat by the treatment pursued, as a careful and thorough treatment of an acute vulvitis, vaginitis, or endometritis may diminish the virulence of the infection. The symptoms will be diminished by keeping the patient quiet and by instituting early appropriate treatment. Keeping the patient quiet and the bowels empty undoubtedly tend to diminish the area of the infection, which will lessen the symptoms.

The symptoms vary with the duration of the infection. As a general rule, the more recent the infection the more acute the symptoms. This is principally due to the fact that the bacteria tends to become less and less virulent and to finally disappear. The symptoms also tend to be more severe in the early stage of the disease than later, as early in the disease the abdominal ostia are open and the infection extends to the peritoneal cavity, and later the abdominal ostia usually become occluded and prevent leakage from the tubes into the peritoneal cavity. In the early stage of the disease the lymphatics and bloodvessels are active in absorption, while later in the disease the lymphatics and bloodvessels about the area of infection become more or less occluded by inflammatory exudate, adhesions, and occasionally by thrombosis, and thus diminish the amount of absorption. The symptoms also tend to diminish as the disease progresses, as the system becomes more tolerant to the infection, either by the production of antitoxins or the bacteria become weakened by their own toxins.

The symptoms will depend much upon the temperament of the patient. Some patients tolerate pain much better than others. As a rule, the more phlegmatic the temperament of the patient the less will she complain of pain, and with a nervous temperament the symptoms are usually exaggerated. The temperament is of so much importance that it should always be considered in estimating the importance of the symptoms.

PLATE LII.

Tubo-ovarian Abscess.

Exact size. The tube curves over the tumor and is seven inches long.

The symptoms are apt to begin with a menstrual period and to follow the symptoms of an endometritis, to consist of pain or an uncomfortable feeling in the region of one or both tubes, or the pain may be general across the lower abdomen and in the back. The symptoms may disappear in a few days, but are liable to recur with a subsequent menstruation. These symptoms may gradually subside and recovery result, or the contrary may occur and the symptoms may get worse and the disease may terminate in a chronic catarrhal or suppurative salpingitis. The reason why the symptoms of a salpingitis usually date from a menstrual period is that an infection extends from the endometrium to the tube much more frequently during menstruation than at any other time.

The symptomatology is divided into subjective and objective symptoms.

SUBJECTIVE SYMPTOMS. 1. *Pain.*—The pain is usually the most prominent subjective symptom and is nearly always present in all varieties of salpingitis. It is often continuous in acute salpingitis and generally intermittent in chronic salpingitis.

In acute catarrhal salpingitis pain is usually the first subjective symptom and may be present for some time before any of the objective symptoms appear. At first the pain is described as an aching in the region of one or both tubes. This pain is principally due to muscular contractions of the tube and is often colicky and intermittent in character. This may occur near or during two or three menstrual periods before any other symptoms appear. As the disease progresses the pain of a localized pelvic peritonitis occurs from escape of the infected secretion through the abdominal ostium. This pain will generally be constant, localized, and will often be so severe as to compel the patient to remain in bed.

The pain at first is usually on one side, but later it generally becomes bilateral. In severe cases it may extend across the lower abdomen and may be referred over the entire abdomen. The pain may be so severe as to require sedatives for two or three days. The pain in acute catarrhal salpingitis seldom lasts more than one or two weeks. Backache is usually present.

In chronic catarrhal salpingitis the pain is principally caused by the inflammatory exudate and adhesions which are described under the pathology. It will be more or less proportionate to the amount of inflammatory exudate and adhesions present. It is increased by flatulency and often on defecation, due to increased intestinal peristalsis. It is usually greater during menstruation as a result of the pelvic congestion which occurs at that time and as a result of a coincident endometritis which is nearly always present. It is seldom continuous unless there is present an inflammatory exudate which presses on some of the pelvic nerves.

The pain in chronic catarrhal salpingitis may be due to distention of the tube from accumulation of the secretion in the tube after the abdominal ostium becomes closed (hydrosalpinx). In this instance

the pain will be proportionate to the amount of tension in the tube and is often colicky and intermittent in character. Severe colicky pains probably never occur in salpingitis until the abdominal end of the tube becomes occluded. The pelvic adhesions and exudate frequently cause much backache. The pain may gradually become less and less and finally disappear, or acute exacerbations may occur when the pain will simulate that of an acute catarrhal salpingitis.

The pain of an acute purulent salpingitis is generally the pain of an acute pelvic peritonitis, as the purulent secretion always escapes into the peritoneal cavity and causes peritonitis. The pain from the pelvic peritonitis is similar to that which is described under acute catarrhal, but exaggerated in amount. It often confines the patient to bed for several weeks and is usually more pronounced on one side.

The pain in chronic purulent salpingitis is due to pressure upon the pelvic nerves by inflammatory exudate, to adhesions or distention of the tubal walls. When it is due to pressure upon some of the pelvic nerves it is continuous, often manifested in backache, and is often referred along the anterior crural or sciatic nerves.

The pain from adhesions is the same as in catarrhal salpingitis, but more pronounced, as the adhesions are usually more numerous and extensive in purulent than in catarrhal salpingitis. Pain from distention of the tubal wall occurs after the abdominal ostium becomes occluded (pyosalpinx) and is proportionate to the amount of tension present in in the sac wall. The pain in chronic purulent salpingitis may gradually become less and less and finally disappear, but acute exacerbations often occur, especially in gonorrhœal infections.

There is no relation of the amount of pain to the size of the tube, as the tension of the tubal walls may be more in a small than in a large sactosalpinx. The pain may or may not be proportionate to the virulence of the infection, as in a very virulent infection necrosis of tissue is more rapid and necrotic tissue is not sensitive. Pain in infections of the tubes is often due to involvement of other organs. There is frequently a coincident infection of the urethra and bladder and the infection may even extend to one or both kidneys. In those cases bladder and urethral pains are not uncommon, and ureteral and kidney pains may occur.

The inflammatory changes often cause intestinal adhesions, and intestinal adhesions are, as a rule, attended by pain, colicky in character, and more noticeable when constipation is present, after eating, and during defecation.

The inflammatory exudate frequently produces displacements of the uterus, especially retroposition, and adherent retropositions are generally attended by pain, especially during menstruation.

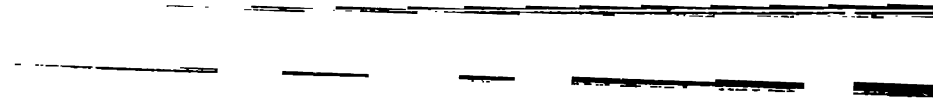
Infections of the Fallopian tubes very frequently cause pain by the involvement of the ovaries, but this will be considered under Infections of the Ovaries.

Much has been said about reflex pains, headaches, etc., from the pelvis, but they occur so seldom, if ever, that it is advisable to state that

PLATE LIII.

Tubo-ovarian Abscess.

Ovarian abscess has been incised and shows the communication between the tubal abscess and the ovarian abscess.



infections of the Fallopian tubes produce no reflex symptoms. It may be said that most of these cases suffer from headaches and other pain far distant from the seat of the disease. These headaches are often due to other causes, frequently result from lack of exercise and out-door life, digestive disturbances, intestinal toxæmias, neurasthenia, and the like. These headaches are no more reflex from the pelvis than are headaches due to grief, sorrow, etc., reflex in character.

2. *Tenderness.* *a.* In Acute Salpingitis.—Pelvic tenderness is nearly always present in acute infections of the Fallopian tubes. The amount of tenderness is usually proportionate to the amount of the pain, as both are due to much the same causes. The amount of tenderness is difficult to estimate on account of the personal equation. In cases where the pain is slight the principal subjective symptoms may be tenderness. The tenderness may vary from very little to inability to tolerate the weight of the bed clothing without causing distress. The location of the tenderness will usually depend upon the location of the infected tube. The amount of the tenderness is generally proportionate to the amount of involvement of the peritoneum. What has been said relative to the pain as regards leakage from the tubes, and occlusion of the abdominal ostia of the tubes, applies to tenderness.

The tenderness will be somewhat modified by involvement of other organs. Intestinal adhesions and coincident infection of the ovaries, uterus, and bladder tend to increase the tenderness.

The tenderness is usually more noticeable in the suppurative than in the catarrhal form of the disease. It, like pain, is not often proportionate to the amount of swelling. There may be a large pelvic mass of exudate and suppuration with little tenderness, and the tenderness may be marked without sufficient swelling to be detected on conjoined palpation.

b. In Chronic Salpingitis. Tenderness is not a prominent symptom of chronic salpingitis, but is usually present and continuous. It is usually described as a "soreness" on one or both sides, depending upon whether the disease is unilateral or bilateral. It is generally augmented by wearing tight or heavy clothing about the abdomen or waist and by intestinal flatulence. It is apt to be increased during menstruation. Tenderness is always more severe during acute exacerbations, which frequently occur in the so-called chronic infections of the Fallopian tubes. Tenderness is often absent when the patient is quiet.

3. *Leucorrhœa.*—It will be remembered that infection of the Fallopian tubes is usually an ascending one, that is, an extension of an endometritis. The endometritis usually persists after the Fallopian tubes become affected, and consequently a uterine leucorrhœa is usually present. It is usually more pronounced in gonorrhœal than in other cases on account of the persistence of this variety of infection. In some cases the chief complaint is the leucorrhœal discharge. The belief is quite common that tubal secretions frequently escape into the uterus and appear as a leucorrhœa. This is an error. The tube seldom or never drains into the uterus.

The canal in the uterine end of the tube is almost never occluded, but is generally diminished in size. In cases of hydrosalpinx the fluid can be forced through the uterine end of the tube by firm pressure upon the tube, but the amount of pressure that is required to do this is more than can be made by contraction of the tubal wall or by forced intra-abdominal pressure. In cases of pyosalpinx one can almost never force pus through the uterine end of the tube, and it is absurd to believe that cases of pyosalpinx ever drain through the uterus. In sactosalpinx the tube is usually displaced into the rectouterine pouch and this causes the contents of the tube to gravitate from the uterine end.

4. *Menstrual Disturbances.*—Menstrual disturbances are not always present, but they frequently occur. They are chiefly due to the coincident endometritis that is generally present. Dysmenorrhœa is the most common of the menstrual disturbances in tubal infections. It is most frequently due to a coincident endometritis, but may be due to uterine adhesions and to an increased congestion of the tubes and ovaries that takes place at this time. Menorrhagia may occur as a result of hypertrophy of the endometrium from endometritis, may be due to an increased blood supply to the uterus due to the inflammatory changes, or may be the result of obstruction to the venous circulation from the same cause. The blood changes that result may diminish or increase the amount of the menstruation. The menstrual discharge may be diminished in chronic cases where the endometritis has progressed to the stage of cicatrization, which causes atrophy of the uterine mucosa. Salpingitis may cause so much general exhaustion as to produce amenorrhœa.

5. *Sterility.*—Sterility is very frequent in infections of the Fallopian tubes, in fact it is the most common cause of sterility in women. It is most often due to occlusion of the abdominal ostia, but may occur without closure of the tubes. Sterility is nearly always present with suppurative disease in both tubes as when suppuration takes place the abdominal ends of the tubal canals are nearly always occluded. In the catarrhal form of the disease the tubes may or may not become closed and the mucosa may not change much, and consequently sterility may or may not result. An endosalpingitis without occlusion of the abdominal ostia may cause sterility as the changes in the mucosa could easily interfere with the transportation of the ova or with the migration of the spermatozoa. This phase of the subject has received almost no consideration in the study of sterility, and unfortunately not enough is known about it to justify one in making any positive statements. It would be a good subject for animal experimentation.

6. *Febrile Disturbances.*—This is usually an objective symptom but may be a subjective one. The patient's statement of chilly and febrile disturbances may be some evidence in distinguishing between an infection and a pelvic neoplasm.

7. *Dyspareunia.*—This symptom is not usually complained of in the acute stage of the disease, as at that time the amount of tenderness is so great as to prohibit cohabitation.

In chronic cases the presence or absence of dyspareunia will depend much upon the location of the infected tube, the amount of pelvic tenderness, and the position of the uterus. When the infected tube is displaced and adherent in the cul-de-sac of Douglas, as frequently occurs, dyspareunia is almost certain to be present. If there is much general pelvic tenderness the pressure upon the cervix will cause pain. Dyspareunia is generally present when the infected tubes cause retroposition and fixation of the uterus, a condition that frequently results. Dyspareunia may also be caused by a coincident vulvitis or urethritis.

8. *Gastrointestinal Disturbances.*—Constipation is frequently complained of and is often due to infection of the Fallopian tubes. It is most often caused by intestinal adhesions, may be due to a rather inactive life that these patients are often forced to pursue, or may depend upon a general muscular atony which is frequently present. Pain upon defecation is usually present when the disease results in adhesions to the rectum, and if there is much inflammatory exudate about the rectum the patient will generally complain of mucous discharges from the rectum.

In the acute stage of the disease nausea and vomiting sometimes occur from peritoneal irritation—that is, from acute pelvic peritonitis. Stomach disturbances may arise from a toxæmia from absorption from the infected area, but more commonly from the intestines as a result of the constipation and intestinal flatulence.

9. *Nervous Disturbances.*—There has been much written about nervousness in infections of the Fallopian tubes, but there is probably no more relation between this and various neurosis than there is between other diseases which produce an equal amount of suffering and pain and nervous disturbances.

Objective Symptoms. 1. *Swelling.*—In the early stage of infection of the tube there is not swelling enough to be detected. The length of time it requires for the swelling to become large enough to be palpable will depend upon the virulence of the infection. An infection of low virulence may produce so little inflammatory change that the tube cannot be palpated. It can be safely said that all cases not attended by a swelling that is palpable are catarrhal, and that suppuration in the tube is always attended in a short time by a palpable enlargement. The ease with which the enlargement can be palpated will depend upon the size of the inflammatory mass, its location, the rigidity and thickness of the abdominal walls, and the amount of pelvic tenderness.

Under favorable conditions one should be able to palpate an infected tube producing a tumor one inch in diameter, and under any condition a swelling extending above the pelvic inlet should be detected.

An infected tube is most easily detected when prolapsed and adherent in the cul-de-sac between the uterus and rectum. Occasionally the swelling from an infected tube can only be palpated on its lower surface with the finger in the vagina or rectum. This most often obtains when the abdominal wall is very tense or contains a large amount of fat. Rigidity of the abdominal walls usually interferes more with detection of an enlarged tube than does a thick abdominal wall. The swelling

may be on one or both side, depending upon infection in one or both tubes. The tube usually prolapses and becomes adherent in the cul-de-sac of Douglas as a result of sagging from its increased weight. When the tube is not prolapsed and not much enlarged, it may at times be detected only as an exudate extending along the broad ligament. The size of the swelling from an infected tube may vary from being so little as to not be palpable to a mass extending to or above the umbilicus. The swelling in an infected tube may be due to a thickening in the tubal wall or to a collection of fluid in the tube, but generally the tumor is largely composed of inflammatory exudate and adherent organs about the tube and is more or less connected with the uterus. The nodules occasionally present in the tubes may be palpable.

2. *Tenderness.*—This is principally a subjective but may be an objective symptom by palpating over affected tissue and then over tissue known to be involved and by diverting the patient's attention while palpating and by observing her facial expression.

3. *Temperature.*—There may be no elevation of the temperature in the early stages of the infection. There may be no fever when the inflammatory changes are catarrhal in character. In acute catarrhal salpingitis, however, there may be a fever of 100° to 101°, but seldom higher, and it is not likely to persist for more than two or three days. With acute suppurative salpingitis there is always fever. There is very little relation between the amount of fever and the amount of suppuration. The amount of fever usually varies with the amount of virulence of the infection. The temperature tends to be higher when there is leakage into the peritoneal cavity and is modified somewhat by the rapidity of absorption. In acute cases there is less obstruction to absorption than in chronic cases with a pyogenic membrane and a large amount of inflammatory exudate, and consequently the fever is more inclined to be higher in the former than in the latter instance. This applies to the chronic cases with an acute exacerbation of the infection, as chronic cases are otherwise usually afebrile.

The acute and chronic stages of the disease are usually but not accurately determined by the presence or absence of fever—as above stated the infection may precede the fever for some time—but for practical purposes febrile cases may be considered acute ones and afebrile cases chronic ones.

The fever in infections of the tubes is seldom so high as to be alarming and does not often remain above 101° or 102° for more than a few days.

The relation of the bacteria, toxins, and fever is not entirely known, but it is safe to say that the fever is caused mostly or entirely by the toxins that are produced. After a time the temperature tends to diminish as the virulence of the infection diminishes and the absorption of toxins lessens until the fever disappears, when bacteriological examinations show the pus to be sterile.

In sactosalpinx purulenta there is always fever during the early stages. The temperature is usually higher in the evening than in the

morning. There is seldom a gradual rise of temperature from day to day. The fever seldom stays above 103° and infrequently reaches 104°. The febrile disturbances seldom last more than two or three weeks. Its return to normal is by lysis. In occasional cases, however, the fever lasts for weeks. This occurs usually where there is rupture or leakage of a tube resulting in suppuration in the pelvis outside of the tube (pelvic abscess). In these cases the abscess is in close proximity to the intestines, in fact an intestine not infrequently forms part of the abscess sac. The infection then is frequently a mixed one with colon bacilli, and the infection may be continually renewed from migration of bacteria through the adherent intestinal wall. A continued infection may also occur from a fistula between the abscess and the intestine.

The pulse is usually proportionately increased with the increase of temperature. As in other conditions the personal equation will determine to considerable degree the pulse rate.

The respirations will also be increased with increase of temperature. The respirations, however, will vary much with the amount of peritoneal involvement. When the peritoneum is involved the patient will tend to avoid abdominal movements and the respiratory movements will be largely thoracic in character. The more diffuse the peritoneal involvement the more rapid, as a rule, will be the respiration.

The presence of fever in infection of the Fallopian tubes always means the presence of a toxæmia or a septicæmia, and one will find the general symptoms of toxæmia or septicæmia, and the symptoms more or less proportionate to the amount of sepsis.

4. *Blood Changes.*—The most important blood changes is the relation of leucocytosis to the fever. During the febrile stage of infection of the Fallopian tubes there is always a leucocytosis which will vary from 8000 to 20,000 and is often proportionate to the amount of fever. It is impossible to distinguish between the catarrhal and purulent variety by the blood count, as in both varieties the white blood corpuscles are increased when there is fever and gradually diminish in number in both conditions as the fever diminishes and finally become normal when the temperature becomes normal. The change in the number of red corpuscles and hæmoglobin will depend upon the amount of anæmia, and the anæmia will often depend upon the duration and amount of septicæmia and the extent of emaciation. The leucocytosis of salpingitis consists largely in an increase in the polynuclear cells.

Objective Symptoms Due to Involvement of Other Organs. *a. Vulva.*—The vulva may show an acute or chronic inflammation.

Chronic vulvitis is of more importance than acute vulvitis, as it is much more common. It will be manifested by irregular red spots and the reddened areas are usually found about the openings of the glands and urethra. The glands most often affected are the Bartholinean glands on one.or both sides. They may be enlarged, may contain pus, or may be cystic. The character of the secretion in these glands may be occasionally determined by manipulating the glands between two fingers, placing one finger in the vagina underneath the gland and the other on

the skin over the gland. A cystic gland is found in the same way. The presence of a cyst in one of them usually means an old infection, generally gonorrhœal in origin. The urethra is frequently the seat of an infection and usually the infection is of the same origin as the tubal infection. An inflamed urethra will be manifested by a redness about the meatus urinarius, and the mucosa will frequently protrude (urethral caruncle) and pus can occasionally be pressed out of the urethra. Skene's glands are often involved. They will be thickened, more sensitive to touch than normal, and will often contain a mucopurulent discharge. They are palpated by placing the palmar surface of the examining finger over the lower end of the urethra, so as to engage the glands between the finger and the pubic bone—then on slight lateral motion of the finger the glands will be detected and will feel like thick, short needles embedded in the urethrovaginal septum. This manipulation will force out any secretion that may be in the glands. Infection of these glands will always increase the thickness of the lower portion of the urethrovaginal septum, and this thickening will frequently be so pronounced as to be a very prominent feature of the condition. Frequently it will be observed that this thickening is more marked to one side than the other, and a unilateral or an unequal thickening of this portion of the septum always means an infected Skene's gland, as otherwise the two sides of the lower portion of the urethrovaginal septum are of the same thickness.

Microscopic examination of the secretions from Bartholinean glands, from the urethra or from Skene's glands, in case of infection of the Fallopian tubes, usually gives a negative result, as the pathogenic bacteria have generally disappeared in these secretions by the time the patient comes under treatment for infection of the Fallopian tubes. At rare intervals, however, gonococci may be found in these secretions and their presence will aid much in determining the nature of the infection.

When a coincident infection of the bladder occurs one will observe the finding of a cystitis and possibly a ureteritis or pyelitis. These findings, that is, the involvement of the Bartholinean glands, the urethra or Skene's glands, in connection with salpingitis, nearly, if not always, means that the infection is gonorrhœal.

b. Vagina.—In infection of the Fallopian tubes the vagina will seldom show much structural change. Its anatomical characteristics are such that infection does not tend to produce chronic changes in it. It will frequently contain discharges from the uterus due to a coincident endometritis, and the discharge often changes the acid reaction of the vagina to alkaline.

c. Cervix.—The cervix frequently shows the appearance found in endometritis for reasons given under pathology of Infections of the Fallopian Tubes. What has been said relative to microscopic examinations of secretions from the vulva applies to microscopic examinations of secretions from the cervix. The external os is usually increased in redness and often eroded.

d. Uterus.—The uterus is frequently enlarged from the endometritis or myometritis or from circulatory disturbances.

Displacements of the uterus frequently take place in infections of the Fallopian tubes. The most common displacement will be retroposition, but the uterus may be displaced laterally by traction from adhesions or traction from thickening of one of the broad ligaments, which shortens the ligament, or a lateral displacement may occur from swelling in and about the tube, pushing the uterus to one side.

Infection of the Fallopian tubes nearly always diminishes the mobility of the uterus, and the amount of diminution of mobility will usually be proportionate to the amount of adhesions and pelvic exudate about the tubes.

e. Intestines.—The intestines are more often found distended in the purulent than in the catarrhal variety, and more often in the acute than in the chronic variety of the disease. The intestinal tympany is due to a weakening of the musculature of the intestine or to an increase in the decomposition in the intestine. With peritonitis the tympany is chiefly due to paresis of the intestines. Adhesions may also produce tympany by interference of the muscular tonicity of the intestinal muscles or by causing partial obstruction. In bad cases of intestinal adhesions the outline of the intestines may be observed by noticing the peristaltic contraction of the intestine.

Diagnosis of Non-puerperal Infections of the Fallopian Tubes.—The differential diagnosis between infections of the Fallopian tubes and infections of the ovaries will be considered under Infections of the Ovaries.

The differential diagnosis between infections of the Fallopian tubes and tuberculosis of the Fallopian tubes will be considered under Tuberculosis of the Fallopian Tubes.

The following points should suggest an infection of the Fallopian tubes:

1. The patient's statement that she has had an infection is often of much value, as the patient may have positive knowledge of the infection and the variety of the infection from the physician who treated her soon after the infection occurred. On the contrary, too much reliance should not be placed upon the patient's statements in this regard, as the patient may attempt to deceive, and often the patient is ignorant of the presence of an infection. There is some danger that a comparatively simple catarrhal vaginitis and vulvitis may be mistaken for a gonorrhœal infection.

2. History of a gonorrhœal infection of the husband. The history of a gonorrhœal infection in the husband will often be of much value in the diagnosis of an infection of the Fallopian tubes. Such an infection in the husband, irrespective of the time which has elapsed, of its duration and its consequences, may be the cause of the infection of the Fallopian tubes. The less the interval, the longer the duration of his disease, and the history of a "gleet" or "stricture," the more will be the liability that the tubal infection is gonorrhœal in origin. It must not be forgotten that the husband's statements may not be truthful. Examination of the husband for stricture and for "threads" and pus in the urine may be of service.

3. Repeated attacks of "inflammation of the womb or ovaries" or "pelvic inflammation." A history of repeated attacks of inflammation of the womb, ovaries, or tubes is often obtained in very chronic cases of infections of the Fallopian tubes, and such a history usually means a gonorrhœal infection. Such a history will not be elicited in acute cases unless the acute attack be an acute exacerbation in a chronic case. No other pelvic disease will often give such a history, but it should be remembered that an old infection in the Fallopian tubes does not necessarily exclude another disease of the Fallopian tubes.

4. History of an acute vaginitis, vulvitis, urethritis, cystitis, or a purulent vaginal discharge. The history of an acute vulvitis, vaginitis, or cystitis, or a history of the symptoms of those diseases or of a purulent vaginal discharge simply means that there has been an infection that may have extended to the Fallopian tubes. One should not conclude, however, that a patient has an infection of the Fallopian tubes because she has had a vaginitis, vulvitis, or cystitis, or a purulent vaginal discharge without the presence of other evidence or proof, as such an infection does not always extend to the Fallopian tubes.

5. Illness dating from marriage. Illness dating from marriage usually means that an infection was contracted at that time and that the infection was probably gonorrhœal in character.

6. History of a puerperal infection. The history of a puerperal infection is not of much importance in the diagnosis of chronic disease of the Fallopian tubes, unless the puerperal infection was gonorrhœal in character. Puerperal infection due to other bacteria seldom becomes chronic or produces repeated attacks of so-called "pelvic inflammation." The patient may suffer from adhesions after such a puerperal infection, but will seldom have the other symptoms of a "pelvic inflammation." With a puerperal gonorrhœal infection, however, the disease is very liable to become chronic and to be attended by acute exacerbations.

7. Sterility. The presence of sterility is important in the diagnosis of infections of the Fallopian tubes to the extent that infections of the genital tract are a cause of sterility. Such an infection may cause sterility by producing a chronic endometritis, an endosalpingitis, or obstruction of the abdominal ostia. The history of sterility may also indicate an old infection in the husband, and the sterility may be due to a pathological condition of the husband. In fact, the husband is often the cause of sterility.

8. The presence of an acute pain—of sudden onset—in one or both inguinal regions, worse on one side, attended by fever. These symptoms seldom occur except in infections of the Fallopian tubes and tubal pregnancy.

9. Redness about the meatus urinarius and infection of Skene's and Bartholin's glands. These things mean that the patient has had an infection and that the infection was probably gonorrhœal in character, and that the infection may have extended to the Fallopian tubes.

10. Tenderness and swelling posterior or to one or both sides of the uterus. Pain produced by pressure on cervix. These symptoms are

usually present in infections of the Fallopian tubes, but may be present in cases of tubal pregnancy.

11. The presence of nausea and vomiting at onset of pain, followed by some distention of the abdomen. These symptoms are often present in acute cases before the abdominal ostia of the tubes become occluded and are due to extension of the infection to the peritoneum.

The diagnosis is often made difficult by the absence of a swelling not large enough to be palpated, by distention or rigidity of the abdominal wall, and by obesity.

Salpingitis which does not produce sufficient swelling to be palpable nearly always means that the disease is of short duration or that the changes produced are catarrhal, as with suppuration one should always be able to palpate the inflammatory mass or to detect an exudate on vaginal palpation posterior or to one or both sides of the uterus.

A positive diagnosis of a catarrhal salpingitis without a palpable enlargement of the tube can never be made, but a probable diagnosis may be made when some or all of the following conditions are present:

1. History of an infection.
2. Signs of an acute or chronic vulvitis, urethritis, vaginitis, or endometritis.
3. Pain and tenderness in the region of one or both tubes.
4. Pain upon palpation of the cervix uteri.
5. Slight increase in temperature.
6. Absence of any other condition to account for the above signs and symptoms.
7. Detection of gonococci in some of the secretions.

Differential Diagnosis.—Differential diagnosis between *catarrhal* and *purulent salpingitis*. Pain is liable to be more acute in suppurative than in catarrhal salpingitis, but is not a reliable differential sign, as in some cases the contrary will obtain.

Tenderness is also more marked, as a rule, in suppurative than in catarrhal salpingitis. This will depend somewhat upon whether the attack is primary or not, as in the primary attack there will be an escape of the infectious material into the abdominal cavity and the tenderness is largely proportionate to the amount of involvement of the peritoneum. The febrile disturbance will generally be more in suppurative than in catarrhal salpingitis.

The amount of swelling is nearly always greater in suppurative than in catarrhal salpingitis. A positive diagnosis can generally be made by the consistency of the swelling. When the swelling feels like a solid exudate there is always suppuration. With suppuration the exudate frequently feels as hard as a board. This never occurs when the case is catarrhal. Catarrhal salpingitis seldom produces a large swelling, while suppurative often results in the formation of a large mass.

The blood changes are usually more prominent in suppurative than in catarrhal salpingitis. A leucocytic count of 15,000 or more nearly always means suppuration. With a small increase of white blood corpuscles, however, one cannot distinguish between a suppurative and

a catarrhal inflammation. One should remember that the white blood count will not be much increased with suppuration when the fever becomes slight and when the infection becomes of slight virulence and the pus encapsulated, and one should not forget that in catarrhal salpingitis with increase in temperature the white blood count may be increased to 10,000 or 12,000.

Distention of the intestines is more often present in suppurative than in catarrhal salpingitis, yet this will depend much upon whether or not the abdominal ostia of the tubes are patent. When the patient's temperature increases after a pelvic examination a suppuration should be suspected, as when such a condition arises the increase in temperature is usually due to dissemination of the infection.

Differential diagnosis between *acute* and *chronic salpingitis*. For practical purposes it is best to consider acute salpingitis as those attended by fever and chronic salpingitis, cases without fever. The exceptions to this rule are:

1. Salpingitis, especially when caused by an infection of low virulence, may exist for a time without producing fever.

2. Chronic cases are subject to acute exacerbations. These cases during the febrile period are classified as acute cases.

Differential diagnosis between *pyosalpinx*, *hydrosalpinx*, and *hæmatosalpinx*. This is often impossible to do without an operation. Fortunately, as a rule, it is of little importance to make a differential diagnosis, as the treatment is much the same for the three conditions.

A hydrosalpinx is nearly always a sequence of a catarrhal salpingitis, and seldom or never the result of a purulent inflammation. The differential diagnosis, consequently, between a pyosalpinx and a hydrosalpinx means a differential diagnosis between a catarrhal and a suppurative inflammation of the Fallopian tubes, and what has been said relative to distinguishing between catarrhal and suppurative salpingitis applies here. A pyosalpinx is frequently encountered during an acute salpingitis; a hydrosalpinx when present is nearly always found in chronic cases. What has been said relative to periodical discharges of pus in cases of pyosalpinx and serum in cases of hydrosalpinx is not of sufficient importance to require serious consideration, as a sactosalpinx almost never empties into the uterus, for reasons given under Pathology.

Hæmatosalpinx occurs so seldom, except as a tubal pregnancy, that it is not necessary to enter into a discussion of its diagnosis.

Diagnosis as to whether the abdominal ostia are closed or not is often difficult or impossible to make without a cœliotomy. This is often of great importance as regards the indications for treatment in cases of sterility. If the patient has had a severe pelvic inflammation referred to both sides of the pelvis, both of the abdominal ostia are almost certain to be closed. If the inflammation is referred entirely to one side, one ostium may be closed and the other open. In cases of slight pelvic inflammation the probability is that both ostia are not but may be occluded. A pronounced swelling in the region of a tube in cases of salpingitis is almost certain to mean occlusion of the abdominal ostium.

A tender, indurated mass in Douglas' cul-de-sac nearly always means that the abdominal end of one or both tubes are adherent there and that occlusion has taken place. A suppurative salpingitis invariably causes occlusion of the tube, and a catarrhal salpingitis often closes the abdominal ostium.

Differential diagnosis between a *sactosalpinx* and *retroposition of the uterus*. This is usually easily accomplished, unless the uterine displacement is attended by adhesions, but uterine adhesions generally mean that the adhesions are the result of a salpingitis. One should always be able to make a differential diagnosis if the sactosalpinx is large enough to be palpable, and is distinguished as follows:

In sactosalpinx one can often get a history of an infection or of a previous "pelvic inflammation." In retroposition of the uterus without salpingitis illness frequently dates from pregnancy or traumatism. In sactosalpinx the pain is usually more severe and is referred to one or both inguinal regions. Pain in retroposition of the uterus is often referred to the back. Tenderness is generally more marked in sactosalpinx.

Leucorrhœal discharge is more liable to be present and greater in amount in sactosalpinx than in retroposition of the uterus.

Menstrual disturbances are generally more prominent in retroposition of the uterus.

Sterility is more common in sactosalpinx.

Symptoms from adjacent organs are more often found in sactosalpinx than in retroposition of the uterus.

In sactosalpinx one should, on conjoined palpation, find the swelling separate from the uterus, and it is usually found behind or to either or both sides of the uterus. The uterus and the enlarged tube should be outlined on conjoined palpation as two bodies. The two bodies should be found to move more or less independently of each other on palpation.

Sactosalpinx is generally attended at some time by fever. This is not so in cases of retropositions of the uterus.

Blood changes are often found in sactosalpinx and not in retroposition of the uterus.

Signs of infection are frequently found in sactosalpinx—about the vulva—urethra, vagina, and cervix, and not in retropositions of the uterus.

Retropositions of the uterus are always attended by prolapse and forward displacement of the cervix and the posterior lip of the cervix is frequently thickened or elongated. Changes in the size of the two lips of the cervix are not often found in sactosalpinx. The two diseases are often associated, as a salpingitis frequently produces retroposition of the uterus.

Differential diagnosis between *sactosalpinx* and *uterine neoplasms*. This is not often a difficult task unless the uterine neoplasm extends into the broad ligament, or the sactosalpinx is large, attended by much surrounding exudate, and closely attached to the uterus. Occasionally

these conditions are so marked that the one cannot be outlined on conjoined palpation from the other.

The history will aid much in distinguishing between the two conditions, as the history of a septic infection resulting in a sactosalpinx is very different from the history of a uterine neoplasm. Pain, tenderness, and febrile disturbances are seldom present in uterine neoplasms in the absence of infection.

Menstrual disturbances are more common in uterine neoplasm, and not so common in sactosalpinx.

Sterility is more often found in sactosalpinx than in uterine neoplasm.

Symptoms from adjacent organs occur oftener in sactosalpinx than in uterine neoplasms.

Signs of infection about the vulva, urethra, vagina, and cervix are frequently present in sactosalpinx and not in uterine neoplasms.

The diagnosis can generally be made upon a conjoined vagino-abdominal palpation. In uterine neoplasm the tumor is continuous with the cervix. There is little or no pain or tenderness on palpation. Most uterine tumors feel hard to the touch and the tumor is usually freely movable. In pedunculated uterine tumors the tumor may not seem to be continuous with the cervix and the tumor may seem to move independently from the uterus, but in pedunculated tumors the tumor usually feels hard to the touch and is usually freely movable. (See Objective Symptoms of Salpingitis.) One should remember that uterine tumors and sactosalpinx may occasionally occur in the same case. The use of the uterine sound will usually make the diagnosis positive, as uterine neoplasms nearly always increase the depth of the uterine canal and frequently make it tortuous. One should usually make a differential diagnosis without the use of the sound on account of its dangers.

Differential diagnosis between *sactosalpinx* and *tubal pregnancy.* It would seem an easy task to distinguish between these two conditions, but they are often mistaken one for the other. To say that 25 per cent. of the cases of tubal pregnancy operated on are diagnosed before operation as sactosalpinx is probably a conservative statement. It is also probably certain that many of the supposed cases of salpingitis that make a spontaneous recovery are cases of tuboabdominal abortion. It is more important to distinguish between sactosalpinx and tubal pregnancy than between sactosalpinx and any other pelvic disease, because of the dangers which attend tubal pregnancy.

The differential points in sactosalpinx and tubal pregnancy are the following:

1. In tubal pregnancy, history of a delayed menstruation of usually one or more weeks. Occasionally the menstrual period is not delayed or the patient may not know the time for the regular menstruation, or a delayed menstruation may be of common occurrence to the patient. Such menstrual irregularities are rather uncommon in sactosalpinx.

2. In tubal pregnancy there is continued bleeding from the uterus, dating from the rupture or abortion of the tube. Continued uterine hemorrhage is seldom present in sactosalpinx. In tubal pregnancy the

cervix may be somewhat softer and the uterus somewhat larger and softer than normal, and in advanced cases the color of the vulva and vagina may be changed.

3. Passage of membranous tissue (uterine decidua) at the commencement of, or soon after, the delayed menstruation. Not found in sactosalpinx.

4. History of infection is more often found in cases of sactosalpinx than in tubal pregnancy.

5. The duration of the illness may be a valuable point in the differential diagnosis, as the progress of the disease in tubal pregnancy is more rapid and in sactosalpinx the illness may date back for months.

6. Nausea of pregnancy and changes in the breast may be present in tubal gestation.

7. In tubal pregnancy the patient may have slight colicky pains in the region of the affected tube before rupture or tubal abortion occurs, and the advent of the "delayed menstruation" is always attended by severe pain in the region of the tube. If the tubal pregnancy is of the "abdominal abortion" type, the pain will continue, will usually be remittent and colicky in character. If the tube ruptures the rupture is attended by severe pain, which may disappear or will be described as a general abdominal pain, due to the blood acting as a foreign body, and to the presence of adhesions. (See Pain in Salpingitis.)

8. The tenderness is less, as a rule, in tubal pregnancy before rupture than in sactosalpinx. After rupture or escape through the abdominal tubal ostium the tenderness will be as marked in tubal pregnancy as in sactosalpinx.

9. Temperature and pulse. In tubal pregnancy the pulse and temperature will not be affected while the tube remains intact. After rupture or abdominal abortion the temperature and pulse will always be affected. For a time, after the hemorrhage into the abdominal cavity takes place, the temperature is often subnormal and the pulse rate increased and the pulse small with diminished resistance. Later the temperature always becomes elevated and is frequently 102° to 103°. At this time the temperature is of little or no value in the differential diagnosis. When the fever appears the pulse will be more rapid, and its rapidity will depend upon the amount of abdominal hemorrhage and fever.

10. In tubal pregnancy colostrum is often found in the breast.

11. In tubal pregnancy the patient often faints or feels faint at the time of intra-abdominal hemorrhage, and the skin becomes cold and is covered with perspiration.

12. In tubal pregnancy one may get all the signs and symptoms of a severe concealed hemorrhage, even to the extent of producing unconsciousness and death.

13. The subjective symptoms from involvement of other organs, such as the vulva, urethra, etc., as found in infections of the tube, will usually be absent in tubal pregnancy.

14. Swelling. The location, size, and consistency of the swelling may be the same in tubal pregnancy and sactosalpinx. Before rupture in

tubal pregnancy, however, the tumor is usually softer and more movable than in sactosalpinx, as the former is not so often attended by strong adhesions and a surrounding inflammatory exudate, as usually occurs with the latter. In tubal pregnancy the tumor increases in size more rapidly than in sactosalpinx. In cases of tuboabdominal abortion the swelling is often like the swelling in a sactosalpinx as determined by conjoined palpation, unless the internal abdominal hemorrhage is large enough to produce a pelvic hematocele, when the conditions on palpation will simulate a pelvic abscess.

After rupture of the tube the hemorrhage is usually so large in amount that the case is not liable to be mistaken for a sactosalpinx. The hematocele that forms is generally located posterior to the uterus.

15. Blood changes. Before rupture or tubal abortion in tubal pregnancy there are no blood changes. After rupture or abortion blood changes are often present and are proportionate to the amount of blood lost and later to the amount of febrile disturbance.

If there is much loss of blood the hæmoglobin will be perceptibly diminished in percentage and is commonly found below 50 per cent. Not so in sactosalpinx. The diminution in red blood corpuscles will usually be proportionate to the anæmia present. In tubal pregnancy the white blood count may not be much changed for a time after the bleeding occurs, but later a leucocytosis is always present and is usually proportionate to the febrile disturbance. A white blood count of 20,000 to 30,000 is at times observed in tubal pregnancy. The white blood count, consequently, may or may not be an aid in the differential diagnosis. There is a possibility, however, that the increase in polynuclear white cells are more common in sactosalpinx than in tubal pregnancy.

16. Examination of uterine decidua or scrapings from the uterus. A microscopic examination of a membranous discharge from the uterus in tubal pregnancy may permit one to make a positive differential diagnosis by detection of decidual cells. The decidual cells can also usually be found on microscopic examination of scrapings from the uterus. Examination of uterine scrapings, however, will be of no service if the patient has had a recent uterine abortion, as then decidual cells are usually found. It is also possible for the decidua to be so completely expelled that no decidual cells will be found in the scrapings from the uterus. One should remember the similarity of decidual cells to the cells found in membranous dysmenorrhœa.

17. Sactosalpinx is generally bilateral, tubal pregnancy is nearly always unilateral, but in case of much intra-abdominal hemorrhage the blood tumor will extend across the pelvis and may be mistaken for a bilateral disease.

Differential diagnosis of *salpingitis on the right side and appendicitis.* One should remember that the two conditions are frequently associated. The appendix may be infected from a salpingitis. The right Fallopian tube may be infected from an appendicitis. An appendicitis may occur in a patient suffering from chronic salpingitis, and a salpingitis may

develop in a patient who has a chronic appendicitis. It is possible to have the two organs affected simultaneously.

The history in the two diseases is apt to be very different. The onset of appendicitis is usually more acute than salpingitis.

In appendicitis there is often a history of previous attacks—a history of colicky pains in the region of the appendix—a history of gastro-intestinal disturbances that are common in the chronic cases.

In salpingitis one often finds a history of an infection, a history of cystitis, vulvitis, urethritis, vaginitis, or endometritis, or a history of a previous attack of "pelvic inflammation." One may also frequently observe the signs of an old infection of the urethra, bladder, vulva, vagina, or endometrium.

Pain.—The pain is usually higher in the abdomen in appendicitis than in salpingitis. It is generally of more sudden onset and more colicky in character in appendicitis than in salpingitis. In appendicitis the pain is often severe from the start, while in salpingitis the pain at first is usually slight.

Tenderness.—In appendicitis the greatest amount of tenderness is, as a rule, at McBurney's point, while in salpingitis the principal tenderness is lower in the abdomen.

In appendicitis the rigidity of the abdominal muscles, especially the right rectus, is more marked than in salpingitis.

Febrile Disturbance.—The febrile disturbance is apt to be more acute in appendicitis than in salpingitis and the temperature is likely to go higher in appendicitis than in salpingitis, as the infection is generally more virulent in the former than in the latter disease. The pulse is liable to be relatively higher in appendicitis than in salpingitis. The respiration is also liable to be more increased and more of the thoracic type in appendicitis than in salpingitis, as the former generally involves the peritoneum more than the latter disease.

Blood examination as yet is of no value in the diagnosis, as the known blood changes are similar in the two diseases. It is possible that an extended investigation in blood cultures may be of value in a differential diagnosis.

Nausea and Vomiting.—Nausea and vomiting are much more frequent in appendicitis than in salpingitis.

Abdominal distention occurs much more frequently in appendicitis then in salpingitis on account of the greater involvement of the intestines in the former than in the latter disease.

The facial expression may be of some value in a differential diagnosis as, when other symptoms are about equal in the two diseases, the patient generally appears more ill in appendicitis than in salpingitis.

Pelvic Examination.—A differential diagnosis is made with more certainty by pelvic examination than by all the other known means of diagnosis. The pelvic examination may be made by a conjoined vagino-abdominal or by a rectoabdominal palpation. The latter should be employed in virgins. The presence of an intact hymen will exclude the probability of a salpingitis excepting tuberculous.

In appendicitis a pelvic examination will generally be negative unless the patient has some chronic pelvic disease. No exudate or swelling can usually be palpated per vagina or rectum—pressure upon the cervix generally causes little or no pain.

In acute salpingitis there is always pelvic tenderness, an inflammatory mass or exudate can nearly always be felt, and pressure on the cervix is always painful. The difference in pain from pressure on the cervix will usually be sufficient to distinguish one from the other.

The age of the patient may assist in the diagnosis, as an appendicitis frequently occurs before puberty and after the menopause, while salpingitis almost never occurs before puberty and seldom after the menopause.

The cases where it is impossible to make a differential diagnosis should only be the ones where both organs are infected.

Differential diagnosis between *salpingitis* and *other non-inflammatory diseases of the Fallopian tubes.* It is not necessary to say much under this heading, as salpingitis and tubal pregnancy are the principal diseases of the Fallopian tubes, and it is usually not difficult to distinguish between inflammatory and non-inflammatory diseases of the tubes.

There are a few cases of primary carcinoma of the Fallopian tubes reported. It is possible to have small fibromata and adenomata in the tubes.

Differential diagnosis between *sactosalpinx* and *broad ligament tumors.* The history is usually different—one has the history of an infection with the signs and symptoms of sepsis, while these are absent in the other.

Sactosalpinx is usually tender to touch while the other is not. An inflammatory exudate is generally present in sactosalpinx and usually absent in broad ligament tumors.

In cases of sactosalpinx there is generally a history of an acute stage of the disease, which is absent in broad ligament tumors.

Differential diagnosis between *salpingitis* and *pelvic cellulitis.* One now seldom sees a non-puerperal case where there is a question as to whether the disease is salpingitis or pelvic cellulitis, although a few years ago most cases of salpingitis were treated as cases of pelvic cellulitis.

Pelvic cellulitis probably never occurs in the non-puerperal state except as secondary to a salpingitis or possibly from an infection following a trachelorrhaphy or some other severe trauma of the cervix.

Prognosis of Non-puerperal Infections of the Fallopian Tubes.—Infection of the Fallopian tubes is always a serious disease, and its seriousness, with good treatment, consists more in its morbidity than its mortality.

The prognosis will depend upon:

1. The variety of the infection. A gonorrhœal infection is the most serious, as in this infection a complete spontaneous recovery rarely occurs. There is no doubt, however, that a spontaneous recovery does occur with this variety of infection. With a gonorrhœal infection, repeated attacks of "pelvic inflammation" usually result. The reasons for this are discussed under Pathology.

2. The virulence of the infection. Any of the infective bacteria may produce only a catarrhal salpingitis, or may cause an extensive suppuration, general septicæmia, and death.

3. The resistance of the body to infection. In people it is impossible to determine how much importance should be given to resistance of the body, as one cannot judge of the degree of virulence of the infection in different patients. In animals, however, it has been proven that well-nourished animals are less disturbed by a certain variety of infection of a certain virulence than poorly nourished animals. The amount of resistance to the infection will usually be found to be proportionate to the amount of general vitality, to the state of nutrition, and to the character of the blood, especially as to anæmia.

4. The treatment pursued. The prognosis is to a large degree directly dependent upon the treatment pursued. The more operative treatment practised in the febrile stage of the disease the higher will be the mortality. The mortality, and especially the morbidity, will also be increased by allowing the patient to suffer repeated attacks of acute salpingitis, which tends to increase the amount of suppuration and which also tends to increase the amount of involvement of adjacent organs.

5. The pathological changes. The mortality and morbidity are usually greater in suppurative than in catarrhal cases.

In catarrhal cases a spontaneous recovery will often result, especially in cases non-gonorrhœal in origin. Spontaneous recoveries may, but seldom do, take place in suppurative cases.

The prognosis also depends upon whether the case is acute or chronic. There is more danger to life in acute cases, but in acute cases the prognosis of a spontaneous recovery is much better than in chronic cases. Spontaneous recovery is also more frequent in acute than in the acute exacerbations of chronic salpingitis. In chronic cases that have had numerous attacks of pelvic peritonitis spontaneous recoveries seldom occur. The prognosis is not always proportionate to the acuteness of the initial symptoms, as the most acute case may make a complete spontaneous recovery, and *vice versa*. Spontaneous recoveries may take place in cases with extensive inflammatory changes.

PROGNOSIS AS TO MORTALITY WITHOUT OPERATION.—The mortality of salpingitis without operation is very small. It is impossible to determine the exact percentage of mortality from statistics. This mortality will depend more upon secondary changes than upon the salpingitis itself. One of the most important secondary changes is nephritis, the nephritis being due principally to the irritation or infection of the kidneys from the elimination of toxic material during the febrile disturbance of the disease. Amyloid degeneration of the kidneys may also result in prolonged suppurative cases. Death may result directly from the disease from an acute septicæmia—from an acute general peritonitis due to escape of the infectious material through the abdominal ostia, through a rupture in the tube, or to migration of bacteria through the tube wall.

The dangers of the disease resulting in a general peritonitis, however, are very slight, as the disease is so located that extension by gravitation is almost *nil*, and as the amount of inflammatory exudate and adhesions are usually sufficiently extensive to limit the area of infection to the pelvis.

Infection of the Fallopian tubes alone is very seldom sufficiently virulent to cause death by septicæmia or pyæmia. Death may result from general exhaustion due to a prolonged suppuration. These cases are few in number, and in the majority of cases are probably due to a secondary or mixed colon bacillus infection from involvement of the intestines.

Prognosis as to Morbidity without Operation.—In a small percentage of cases of salpingitis, especially non-gonorrhœal, a spontaneous and complete recovery may result in a short time. Probably about 25 per cent. of the patients enjoy good health except during acute exacerbations of the disease. Quite a large percentage of the cases suffer from almost continuous pain after the disease becomes chronic. The amount of suffering will vary with the amount of adhesions, especially intestinal adhesions—the amount of inflammatory exudate—the amount of fluid distention of the tube, and the amount of coincident infection. The morbidity may cease by the occurrence of a spontaneous recovery, or by suppuration, causing an abscess, the abscess rupturing and recovery taking place. With rupture of the abscess, however, the suppuration is liable to continue, and morbidity may result from the presence of numerous adhesions which always exist in such cases. Sepsis is often present in these cases, as the abscess cavity and sinus frequently persist and a mixed infection often results, especially if the rupture occurs into an intestine. In a considerable percentage of these cases the abscess refills and empties itself and thus produces a remittent type of fever.

Topical application of remedies and general medication do not diminish the morbidity of salpingitis to any extent. They influence the morbidity very little except as they may benefit the general health of the patient.

Prognosis as to Mortality with Operation.—Many statistics have been given to determine the mortality of salpingitis with operation, but they are of questionable value, as so many factors are involved. Prominent among these factors is the personal equation of the operator, the personal equation of the patient, the facilities present, and the pathological conditions encountered. To say that the mortality of salpingitis with operation is higher than the mortality of salpingitis without operation is probably a conservative statement. The mortality is higher than it should be, as many of the operations are done by inexperienced operators and with unfavorable facilities, and frequently made during inadvisable periods of the disease. The above statement does not question the advisability of operative treatment for salpingitis in properly selected cases, but should be interpreted as meaning that the principal value of operative treatment is to diminish the morbidity of the disease.

The mortality of operative treatment is much lower when the operation is made when there is no fever than when there is fever. This does not mean in the absence of pus, but in the absence of fever. The mortality is little or no more in suppurative than in catarrhal cases if the pus is sterile as it is in afebrile cases. In fact more danger attends the operative treatment of cases of acute catarrhal salpingitis than of cases of chronic suppurative salpingitis. The mortality is high in cases of salpingitis that are operated upon during the febrile period of the disease.

The mortality of operations depends very much upon an aseptic technique. The mortality in afebrile cases is in almost direct proportion to the character of the operation as regards asepsis. If it were possible to collect all the statistics of operations for salpingitis during the febrile (septic) stage of the disease, the mortality would probably be from 5 to 15 per cent.; in the afebrile (non-septic) cases the mortality is probably from 1 to 5 per cent. The mortality of operative treatment in afebrile cases of salpingitis in the hands of experienced operators, with modern hospital facilities, should be less than 1 per cent.

The prognosis will depend much upon the character of the operation, as the mortality in septic cases is much lower from incision and drainage of abscesses than from radical operation.

PROGNOSIS AS TO MORBIDITY WITH OPERATION.—Not many years ago the morbidity after operations for salpingitis was so great that many physicians questioned the advisability of operation in most cases of salpingitis. The advances made in the operative treatment of salpingitis has not only diminished the mortality to a minimum in favorable cases, but has done more than this in the decrease of the morbidity of the disease. One should not mistake the morbidity of the disease for the morbidity due to operative interference—and one should remember that many cases of salpingitis have become pronounced neurasthenics before operation.

The morbidity of operations has been diminished in the last few years by:

1. Use of a more aseptic technique, which has diminished postoperative pelvic exudates and adhesions.
2. More thorough removal of the diseased tissue. One never hears nowadays of tender and painful tubal stumps.
3. Attention to raw surfaces in pelvis and on intestines, which also diminishes the amount of postoperative adhesions.
4. Use of less drainage, which has diminished postoperative infection, has diminished amount of adhesions, has lessened the dangers of intestinal fistula, and has permitted complete closure of the wound, and thus minimized the dangers of hernia.
5. Closure of the wound in layers, which has lessened the number of postoperative hernias.
6. Preservation of sufficient ovarian tissue to avoid an artificial menopause. The preservation of the menstrual function has in a large percentage of women a pronounced psychical effect, prevents atrophy of the genital organs and neurotic disturbances.

7. More conservative operations.

Statistics would be of more value in the prognosis if a careful distinction were made between the different varieties of infection, but this is not always possible, as the variety cannot always be determined without operation and frequently after operation it is impossible to do so.

Prognosis cannot always be accurately determined for two or three years after operation, as premature climateric disturbances, pain in scars, digestive disturbances, adhesions, neurasthenic symptoms, etc., may obscure the actual results.

Although the morbidity of operations has been materially lessened, one should remember that these operations have not yet reached that point of perfection where one can always expect them to remove all the morbidity of the disease, or to never be followed by a morbidity due directly to the operation.

PROGNOSIS AS REGARDS STERILITY.—The prognosis as regards sterility is always bad in cases of salpingitis. The prognosis in this regard will depend upon the condition of the abdominal ostia—of the mucosa of the tubes and of the endometrium. If both of the abdominal ostia are closed pregnancy is impossible without a plastic operation on the tubes. In rare cases where the tubal ostium is closed by agglutination absorption of the exudate may open the end of the tube. An artificial abdominal ostium has frequently been made in the tube and in a considerable number of patients the operation has resulted in a cure.

Sterility is more liable to occur when both tubes are affected than when only one is involved, and is more common in very chronic cases than in others. Salpingitis always increases the dangers of pregnancy and the puerperium, as bacteria may remain latent in the tube and produce a puerperal infection, and the presence of pelvic adhesions frequently causes trouble during pregnancy.

The prognosis from salpingitis is always worse if the husband has a chronic gonorrhœa on account of the danger of reinfections.

Salpingitis is considered by some as an important factor in the etiology of ectopic gestation.

Treatment of Non-puerperal Infection.—The treatment of non-puerperal salpingitis will be divided into:

1. Prophylactic.
2. Non-operative or palliative.
3. Operative.

1. PROPHYLACTIC.—As infection of the Fallopian tubes results, in nearly all cases, from an extension of an infection of the vulva, vagina, and endometrium, the prophylaxis is consequently and essentially the prevention and treatment of vulvitis, vaginitis, and endometritis. For a detailed consideration of the prevention and treatment of vulvitis, vaginitis, and endometritis see chapters upon these subjects.

As a very large percentage of all cases of non-puerperal salpingitis are gonorrhœal in origin, the prevention of gonorrhœa in this relation is of extreme importance. Instruction of patients suffering from gonor-

rhœa, as to its character and dangers, by the attending physician, will accomplish much in the prevention of gonorrhœal salpingitis.

How soon is it safe for marriage to take place after a gonorrhœal infection? There is always danger of an infection after an attack of gonorrhœa, as one can never be certain of a complete cure. The presence of gonococci in a urethral discharge should prohibit matrimony. The presence of gonorrhœal strictures or "threads" containing gonococci in the urine should also prohibit marriage. A microscopic examination should be made the day following a urethral injection with a solution of silver. The dangers of an infection will be less the longer the interval since the infection and the less the duration of the disease.

The history of a posterior gonorrhœa or epididymitis increases the dangers of an infection, as in these cases the deep glands and prostate are very liable to be infected.

Can a gonorrhœal infection of the vulva and vagina be prevented from extending to the Fallopian tubes?

The disease not infrequently has extended to the endometrium and, at times, to the tubes before a physician is consulted. If a case of gonorrhœal vulvovaginitis is seen early, much can probably be done to prevent extension of the infection by keeping the patient quiet, by active use of some of the silver salts, and by the frequent use of douches for cleanliness. We believe it is of great importance to continue the use of the douches during the menstrual periods as long as the disease continues, as an extension of the infection usually takes place at this time on account of the congestion, œdema, and the presence of blood serum (which is present at that time). One should remember that blood serum is the best culture medium for gonococci. The use of small douches at a moderate temperature does not disturb menstruation.

Can one prevent the extension of a gonorrhœal infection of the endometrium to the tubes?

The use of topical applications and curettage in cases of gonorrhœal endometritis tends to increase and not to diminish the dangers of involvement of the tubes. Care as to quiet, exposures during menstruation, violent and excessive coitus may diminish to a slight extent the dangers of an extension of the infection to the tubes.

One should bear in mind the danger of carrying an infection from one patient to another by carelessness in cleansing the hands and the care of instruments. Instruments should always be boiled after treating one patient and before treating another patient, and yet many physicians have no means of boiling instruments in their offices.

2. PALLIATIVE TREATMENT.—The term palliative treatment is used here because no non-operative remedies are known that can cure cases of salpingitis. When a cure results the recovery is due almost entirely to the efforts of nature.

Palliative treatment is of great importance, however, as it tends to lessen the suffering of the patient. It is of especial importance in cases of acute salpingitis, and is often valuable in chronic cases.

In cases of acute salpingitis the principal treatment consists in:

1. Recumbent position.
2. Ice-bag or hot-water bag over the lower part of the abdomen.
3. Hot vaginal douches.
4. Liquid diet.
5. Saline cathartics, preferably per rectum.
6. Opiates when needed for severe pain.

The patient should be kept in the recumbent position, especially in the early part of the disease. This position lessens the amount of pain and may influence to some degree the extent of the infection. Cold or dry heat over the lower portion of the abdomen will lessen the amount of pain. Cold is best obtained by the use of an ice-bag. The ice-bag should be used continuously as long as there is much pain or fever. The claim has been made that the ice-bag diminishes the amount of congestion and lessens the dangers to suppuration. This is improbable, as the cold cannot penetrate the tissues to much depth and cannot reach the bloodvessels or the nerves that supply the tubes. The ice-bag acts as a superficial local anæsthetic and lessens the amount of fever as the continuous application of cold to any portion of the body would do. In a few cases the patient will object to the use of ice. It may not always be easily obtained and it may chill the patient. Under these circumstances dry heat may be used instead and will act as a local anæsthetic in much the same manner as the ice.

Hot vaginal douches do no good unless their use is attended by diminution of pain. They often lessen pain by producing more or less local anæsthesia. The hot water does not come in sufficiently close proximity to the ovarian vessels and nerves to influence the disease to any great extent. Hot rectal douches would come in much closer proximity to the disease than would vaginal douches.

Liquid diet is valuable. It leaves very little residue in the bowels, and in the acute cases digestion is too much disturbed to care for much solid food. If the digestion is good, however, there is no objection to giving a semisolid or light diet. Liquids should, however, be given in large amounts to stimulate the excretory organs.

Saline cathartics are of use to prevent accumulation of feces and to increase elimination. When given by enema they also produce a local depletion. The following enema will usually produce sufficient catharsis:

℞—Magnesii sulph. . . . . ʒj.
Glycerinæ . . . . . ʒij.
Aquæ . . . . . ʒiij.
M. Sig.—Use as enema once or twice daily as needed.

Opiates, preferably codeine, should be given if the pain is very severe, or if the pain interferes much with sleep.

In nearly all cases of salpingitis the above treatment is all that is required during the acute stage.

A discussion of the non-operative treatment of chronic salpingitis is of great importance on account of the large number of cases and on account of the very extensive use of topical vaginal applications. It is

not so very important on account of the results which it accomplishes, as the value of non-operative treatment of chronic salpingitis is very problematic. An argument which is often made in support of topical vaginal applications is that good results are obtained.

In reply it may be said that good results are obtained in cases of chronic salpingitis without the use of any topical vaginal applications. We believe that a judicious consideration of the merits of topical applications in the treatment of chronic salpingitis shows that they do little or no good.

The following are the remedies that are in frequent use in the topical treatment of chronic salpingitis:

1. Hot vaginal douches.
2. Vaginal tamponade.
3. Vaginal application of tincture of iodine, glycerin, ichthyol, etc.

Massage and pressure with a bag of shot in the vagina or over the lower abdomen is occasionally employed. Electricity in one form or other is also used to some extent.

Hot vaginal douches are generally given, with the patient in the recumbent posture, twice daily, and continued for five to ten minutes.

What does this accomplish?

If the water is hot it produces some temporary anæsthesia of the vagina and causes a temporary dilatation and later a contraction of the vaginal bloodvessels.

How does this produce any curative influence in the treatment of chronic salpingitis?

If the hot douche came in close proximity to the vessels and nerves of the diseased organs it might have some curative power. One does not employ hot-water applications for periods of five to fifteen minutes twice daily for diseases in other parts of the body, and yet this is being very generally done for chronic salpingitis. Hot vaginal douches in cases of chronic salpingitis are useful for cleanliness, they at times give some relief from their local anæsthetic action, but they have no curative power.

Vaginal Tamponade.—Vaginal tamponade is contraindicated in acute salpingitis; the pressure from it causes pain and would do more injury than good. In the consideration of vaginal tamponade for the treatment of chronic salpingitis, what they do will be noted first, and then their therapeutic value will be discussed.

The vaginal tampon should be made of wool because of its elasticity and the fat should not be removed so that it will not absorb. It should be inserted with the patient in Sims' or in the knee-chest position, preferably in the latter position. As much of the wool should be used as is possible without causing distress. The tampons should be worn continuously except during menstruation; that is, when one set of tampons are removed another set should be inserted. Unless the tampons are used in a thorough and consistent manner they have no prolonged action and are of no use. No attention should be given to the relation of the tampons to the cervix. The object of the tampon

is to elevate the uterus in the pelvis. The tampons have no effect upon the tubes except indirectly by pressure upon the uterus.

Action of Tampons.—They will distend and elongate the vagina. Elongation of the vagina means elevation of the uterus in the pelvis. This may cause some of the intrapelvic adhesions to stretch and may possibly promote absorption of adhesions and inflammatory exudate. The effect relative to the absorption of inflammatory exudates must be very small, as the amount of pressure exerted is slight. After one has experienced the difficulties that frequently attend the separation of the adhesions in some pelvic operations, one is forced to the belief that their treatment by vaginal tamponade offers little hope of success.

The belief has become quite general among gynecologists that the application of medicines in the vaginal canal is of no use in the treatment of salpingitis. Glycerin has been used more than any other remedy on account of its hygroscopic property. It depletes the tissues, but the depletion affects the vaginal and not the vessels of the tubes.

Ichthyol has been highly extolled for its anæsthetic and absorptive properties. The author has used it frequently and was never able to observe any beneficial results from it in the treatment of chronic salpingitis. There is no reason to believe that iodine applied to the vaginal vault penetrates the tissues sufficiently to produce any beneficial result upon infected Fallopian tubes. Much has been said relative to the treatment of salpingitis through the uterine cavity by catheterizing the tubes, etc. Such treatment is anatomically an impossibility. Curettage has been frequently done with the hope that it would benefit a chronic salpingitis by facilitating drainage through the uterus.

The tubes normally drain into the peritoneal cavity, although the cilia move toward the uterus. It would be difficult to reverse the current in normal tubes, and this difficulty would be increased in infected, prolapsed, and adherent tubes. Pressure in the vagina and on the lower abdomen by the use of bags of shot has been used. The results obtained, the reception which this treatment received from the profession, and the theory of its action would indicate that mention of this remedy is all that is needed here.

Electricity in various forms has been often recommended in the treatment of chronic salpingitis. It may have a slight anæsthetic action, but the results that are obtained are usually disappointing. The use of electricity in the treatment of salpingitis is either an imposition upon the patient or a reflection upon the intelligence of the physician.

Massage is less often used now in the treatment of chronic salpingitis than formerly. The probable reasons for this are that very few physicians learn how to use it; there is always an objection to the manipulations required in the application of massage, and contraindications are often impossible to determine without an exploratory incision.

From what has been said one might conclude that our only treatment for chronic salpingitis is operative. To advise operation as the only treatment for chronic salpingitis would be an error, as under Pathology, Symptomatology, and Prognosis it will be observed that many of these

cases, even with extensive pathological changes, recover without operation. We do say, nevertheless, that the topical remedies that are so frequently used for chronic salpingitis are of little or no value.

Nature, without much aid from the physician, must be given the credit for these cures. It is, however, of great importance to improve the general health of the patient as much as possible by giving attention to the hygiene, to the nutrition, to the eliminative organs, and to the judicious amount of exercise and rest. In these cases the general treatment of the patient is much more important than the local medicinal treatment of the disease. Attention as to rest and care, as to violent exercise, are of extreme importance in all cases of subacute and in many cases of chronic salpingitis.

The use of anodynes in cases of chronic salpingitis is usually inadvisable on account of the danger of drug habits, and they generally have a deleterious effect upon the general health of the patient. During acute exacerbations of the disease, however, it will at times become necessary to use them.

Treub (Congress of Madrid) reports 612 cases of salpingitis treated without operation, and reports that 433(70 per cent.) were cured. His treatment consisted in the use of rest, ice, hot douches, etc. As some of them had relapses he concludes that 50 per cent. of cases of salpingitis can be cured without operation.

Nebisky observed 360 cases of salpingitis. He classified 240 as slight and 120 as severe in character. He considers all cases where the swelling is larger than a finger as severe cases. Of the 240 "slight cases," 147 were gonorrhœal in character. Of the 120 "severe cases," 102 were gonorrhœal. In 2 of the cases the pyosalpinx ruptured into the peritoneal cavity, producing general peritonitis; both recovered.

He advises conservative treatment. In the acute stage he advises for local treatment ice only.

In chronic cases he advises the use of hot water, hot air, shot bag for pressure, ichthyol, alcohol, massage. He operated on only 50 of the 360 cases. Many of the cases not operated on remained comparatively well for six months. Observation was not continued longer or no report of it was made.

Pelham and Keitler report on 126 cases treated by conservative methods. They subsequently examined 81 of them, and the others wrote and sent letters from their doctors. Of the 81, 74 were able to work; 5 were incapacitated for work. Of 84 gonorrhœal cases 7 became pregnant. After the use of conservative treatment 10 of them were operated on later. The conservative treatment lasted two to twenty-four weeks. They give exhaustion, virulent pus, firm adhesions, and very young patients as contraindications for radical treatment.

One should remember that with non-operative treatment and even with conservative operations it is difficult to determine when the patient is cured, as the disease (especially gonorrhœal cases) may remain quiescent for two or more years and then become active.

What cases should be treated by non-operative methods?

1. All acute cases that do not result in well-defined abscesses, that can be easily incised and drained. This includes nearly all acute cases.
2. Chronic cases with acute febrile symptoms, unless there are large abscesses present that can readily be incised and drained. This includes the majority of chronic cases during acute exacerbations of the disease.
3. Chronic cases that are not attended by much suffering and that have not had repeated acute attacks of the disease.

In determining the best treatment for many of the milder cases of chronic salpingitis one should bear in mind the possibility that postoperative symptoms may result even under the most favorable conditions, and that the postoperative symptoms may cause more distress than the disease. One should also not forget that the mortality, although small, with modern methods and with well-trained operators, for operative treatment has not been eliminated. Important factors in deciding for or against operative treatment are the facilities present and the experience of the operator. Conservative treatment can be more safely followed for patients living in the city than for those living distant from hospitals and competent surgeons. Conservative treatment is better adapted for non-gonorrhœal than for gonorrhœal cases, as spontaneous recoveries are more common in the former than in the latter cases. Conservative treatment is usually not indicated for cases that have had repeated attacks of pelvic "inflammation." The occupation should be considered at times in determining for or against operation.

Operative Treatment.—The operative treatment of salpingitis is divided into:

1. Incision and drainage.
2. Cœliotomy.
   A. Abdominal.
   B. Vaginal.

Indications for Vaginal Incision and Drainage.—It is usually the operation of election for acute cases. It is indicated when the amount of suppuration is extensive and is in close proximity to the vaginal canal. In these cases a well-defined mass can usually be felt between the uterus and the rectum, extending to one or both sides, which frequently causes a bulging of the upper portion of the posterior vaginal wall. Such abscesses are peritubal (pelvic abscesses) and usually result from rupture or leakage of a pyosalpinx. (See Pathology.) In doubtful cases the progress of the disease will often enable one to decide for or against this operation. If the tendency of the patient is to improve, palliative treatment can be continued; if the tendency is to get worse, vaginal incision and drainage should not be delayed after the abscess can be easily felt in the posterior vaginal fornix. In non-puerperal cases there is usually very little risk in delaying operation until one is certain of being able to open the abscess without danger of injury to intervening organs or of opening the general peritoneal cavity.

It is the ideal operation for the cases where the abscess is discharging continuously or periodically into the bowels, as recovery is usually rapid,

is frequently complete, and the intestinal fistula nearly always closes spontaneously.

In chronic cases vaginal incision and drainage is seldom indicated, because in these cases the pus is nearly always sterile and a more radical operation can be safely done. It is, however, good treatment in cases where the abscess is large, is in close proximity to the vaginal wall, and where there is no indurated abscess wall. In some of these cases where there is a large amount of emaciation and exhaustion it will at times be good treatment to pursue as preparatory to a more radical operation. It will be good treatment in some cases where the conveniences for operative work is not good, or where an experienced operator cannot be secured.

A summary of indications for vaginal section and drainage is given in a paper I read before the Illinois State Medical Society in 1902[1] and is as follows:

Indications for Vaginal Section and Drainage in Pelvic Abscess.—1. All acute cases in which a large abscess is in close proximity to the vaginal canal.

2. All other acute cases in which it is not possible to open the abscess extraperitoneally through an abdominal incision, and in which the symptoms indicate great danger in delaying operation until the suppuration extends to the floor of the pelvis, or to the abdominal wall, or until the case becomes afebrile.

There are a few exceptional cases where it may be advisable to do a radical operation during the febrile stage. I believe the danger of this kind of radical operations (especially abdominal sections) cannot be too much emphasized. The danger of radical operations during the febrile stage is usually infinitely greater than the danger of waiting for the afebrile stage plus the danger of operation at the latter period.

3. All circumscribed, large chronic abscesses, with small amount of inflammatory exudate, which can be easily opened through a vaginal incision.

The number of these cases will be small and will not include gonorrhœal and tuberculous abscesses, as they are always attended with a large amount of inflammatory exudate. Acute is intended to include all febrile, while chronic includes all afebrile cases. From a bacteriological standpoint acute cases might be classed as septic and chronic as non-septic cases.

The indications should be governed somewhat by the nature of the infection. Puerperal cases are usually the best subjects for vaginal section and drainage, as the amount of inflammatory exudate in these cases is comparatively small and tends to entirely disappear by absorption.

Gonorrhœal cases are bad subjects for incision and drainage, as they are usually attended with a large amount of exudate and the gonococci are liable to remain latent and to cause trouble after an indefinite time.

[1] American Gynecology, August, 1902.

Gonorrhœal cases are especially dangerous to operate upon during the acute stage on account of the great liability of septicæmia, and operations in these cases can usually be postponed with safety until the afebrile stage, when the operation should be a radical one. In my experience it is often impossible to determine before commencing the operation whether it should consist in making a vaginal section and drainage or in doing a more radical operation. In such cases I am inclined to make a vaginal section for exploration, and then determine what seems to be the most advisable procedure to pursue. An extremist might say that it is impossible for a suppurating Fallopian tube or ovary to recover after incision and drainage. If this be true, then the same is true of the connective tissue adjacent to the suppurating tube or ovary which has been subjected to the same infection and to the same kind of inflammatory exudate, except for the influence of the tubal mucosa. The same might be said of an abscess of the breast and other abscesses.

FIG. 280

"A free transverse incision is made . . . the wound is enlarged by a longitudinal incision."

The conclusion is that only a small percentage of cases of pelvic suppuration should be operated on during the febrile period, and when operation is required at that time it should usually consist of vaginal section and drainage. In doubtful acute cases the tendency of the disease to improve or to get worse will often be of aid in determining the best method to pursue.

A review about a year ago of my cases at St. Luke's and Wesley Hospitals showed that in 608 cases of pelvic disease 41 of them were treated for pelvic abscesses by vaginal section and drainage; 1 died. In this case the operation was performed ten days after an abortion and the patient had a large pelvic abscess, with general suppurative peritonitis.

Four of these cases required subsequent operations. In one of these an abscess occurred three years after the incision and drainage without any

apparent cause and was removed by abdominal section. Another developed an abscess two and one-half years later as the result of a gonorrhœal infection and was treated by vaginal section and drainage. This shows that about 10 per cent. required subsequent operation.

Drainage.—I formerly almost invariably employed tube drainage, but now usually use gauze drainage, as experience has taught that the use of gauze drainage is usually attended by less temperature, is less painful, requires less care than when rubber tubes are used, and a more rapid

FIG. 281

"The cavity is lightly filled with the gauze."

convalescence follows. Tube drainage always tends to increase the amount of suppuration. The drain consists of a narrow, continuous strip of gauze. The cavity to be drained is exposed by two long retractors and is lightly filled with the gauze (Fig. 281). If the progress of the case is satisfactory none of the gauze is removed until the end of forty-eight hours when about one-fifth of it is removed, and this is repeated each twenty-four hours until it is all removed, when the cavity will be nearly obliterated. In a few pus cases it has been made necessary, by the presence of unfavorable symptoms, to remove the gauze earlier

and to resort to frequent antiseptic irrigations, with or without the use of rubber drainage tubes.

In exceptional purulent cases the abscess is located in front of the uterus and is best treated through an incision in the anterior vaginal fornix. I have had two such cases. In these cases, however, it is advisable at times to make also a free incision posteriorly to the cervix so as to drain the most dependent portion of the abdominal cavity. In one case, which I opened and drained through the anterior vaginal fornix, an incision through the posterior vaginal fornix showed that some of the pus had escaped into Douglas' cul-de-sac.

The care after vaginal section and drainage consists chiefly in the care of the drainage, as given above. The patient should be kept in the dorsal position for twenty-four hours if the general peritoneal cavity has been opened, and in such cases it is well to elevate the head of the bed to facilitate drainage. After twenty-four hours the position of the patient is not important, as by that time adhesions will be formed that will separate the gauze from the rest of the peritoneal cavity. After the gauze is removed drainage will be facilitated by allowing the patient to sit up or even walk. The small sinus that remains after removal of the drainage usually requires no attention except the use of antiseptic vaginal douches for cleanliness, but if there is any tendency for secretions to be retained it is our practice to have the cavity irrigated once daily through an intrauterine irrigator and not attempt to repack with gauze.

What results may be expected from vaginal section and drainage?

In suitable cases about 90 per cent. of cures may be expected. About 10 per cent. of the cases will require subsequent operations. It is a conservative statement to make that the result will be better in this 10 per cent. of cases with the vaginal section and drainage as a preliminary operation than would be obtained without it. Experience has shown that vaginal section and drainage does not make a radical operation more difficult, but diminishes the amount of inflammatory exudate and adhesions. Its chief use, however, as a preliminary operation is to postpone a radical operation until the disease ceases to be septic and until the general health of the patient is so much improved that the dangers from a radical operation are minimized.

Pelham and Keitler report in 21 cases treated by vaginal section and drainage two pregnancies. In 2 of the cases incision and drainage had to be repeated. They believe that gauze drainage is competent to cause complete obliteration of the tube. They believe that small peritubal abscesses are no contraindication to incision and drainage, as they will rupture into the tube or be absorbed.

Traub reports that of his cases of conservative operations, 7 required radical operations. He says that the danger of a relapse after conservative operations is very small. In suppurative cases he prefers vaginal incision through the posterior fornix to abdominal section. "Colpotomy gives a mortality of 2 per cent. Radical operations 5.6 per cent."

Cœliotomy—A. Abdominal. B. Vaginal.

Indications for cœliotomy in cases of salpingitis:

1. All cases not included under indications for non-operative and for vaginal section and drainage.

2. Nearly all cases included under indications for non-operative treatment that are not cured and do not become cases for vaginal section and drainage.

3. All cases of vaginal section and drainage that are not cured (this means 5 to 10 per cent. of those cases).

Cœliotomy is seldom indicated for acute salpingitis or for chronic salpingitis during acute exacerbations of the disease. In a few of these cases, however, where the tendency of the patient is to continually get worse in spite of palliative treatment, and where incision and drainage are not indicated, cœliotomy should be made. One should remember even in those exceptional cases that the acute attack usually subsides in two or three weeks, that cœliotomy in acute cases is always attended by considerable danger to life, and that there is very little danger of rupture of the tube into the general peritoneal cavity.

Cœliotomy is indicated in all chronic cases that are having repeated attacks of pelvic peritonitis, or where the disease is producing much pain or distress. Chronic salpingitis that has produced displacement and adhesions of the uterus or ovaries frequently indicates a cœliotomy. Cœliotomy should be made in chronic salpingitis which has produced occlusion of the tubes in the treatment of sterility.

A swelling in or about one or both tubes as the result of a salpingitis is no indication for operative treatment in the absence of subjective symptoms. Even in suppurative cases it is possible for the pus to become sterile, to cease to endanger the life of the patient, or to menace her health.

In cases of cœliotomy for salpingitis what are the relative indications for plastic operations upon and of excision of the tubes?

The advantage of plastic operations upon the tubes is the possibility of preserving the function of reproduction. There is no other indication for plastic operations upon the tubes. These operations are slightly more difficult and dangerous than salpingectomy, and the only function that is disturbed by removal of the tubes is reproduction.

In studying the value of plastic operations upon the tubes one should remember that the disease that produced the salpingitis may have produced sterility from its effect upon the endometrium and ovaries, and in all of these cases the probability of sterility in the husband should be considered.

The indications for plastic operations upon the tubes varies with the age, the social position, and the desire of the patient to have children. It would be unwise to do plastic operations upon the tubes at or after the menopause. It would be inadvisable to perform plastic operation upon the tubes of patients that are especially liable to infections or who persist in interrupting pregnancies.

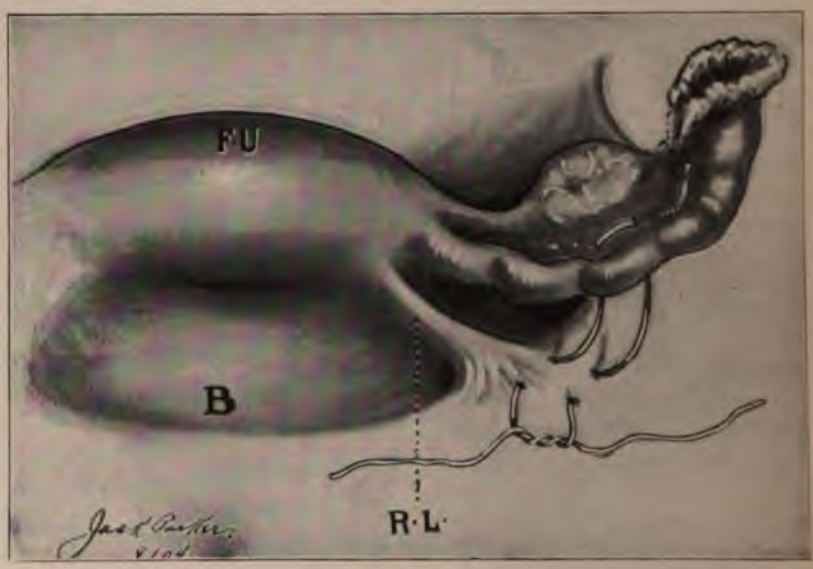
A disease in one or both tubes modifies the indications for plastic tubal operations. The special objections to plastic operations upon

a tube is the danger that it may continue to affect the patient's health and that it may even necessitate subsequent removal. One can never be certain from examination of a tube *in situ* as to the presence or absence of an infection, latent or otherwise.

To wash out a Fallopian tube with an antiseptic solution, as has been recommended to free it of an infection, is useless or harmful tinkering on account of the anatomy of the endosalpinx and the relation of bacteria to mucous membranes. Drainage of Fallopian tubes through a vaginal incision offers very little hope of success, as the drainage is very apt to produce adhesions that will occlude the tubal ostea.

CONSERVATIVE OPERATIONS UPON THE TUBES.—1. Prolapse of the Fallopian tube into the cul-de-sac of Douglas. This displacement

FIG. 282



Stitching together round ligament and mesosalpinx to prevent prolapse of the Fallopian tube. *F. U.*, fundus uteri; *B*, bladder, and *R. L.*, round ligament.

of the tube is very apt to occur whenever it becomes increased in weight from any diseased process, from the action of gravity, or the displacement may be secondary to a displacement of the uterus or an ovary. The displacement in itself is of no importance unless the tube becomes adherent. If adhesions are present and are separated there is always danger of the tube prolapsing again and causing distress, as the denuded surface is very liable to cause adhesions again. This tendency to displacement may be prevented by suture of the mesosalpinx to the round ligament. This suture should be placed sufficiently distant from the uterus to prevent prolapse, but care should be observed not to kink the tube with the suture (Fig. 282).

The presence of adhesions involving the serosa of the tube is no indication for its removal if the abdominal ostium is not occluded and the mucosa apparently healthy. Adhesions of the serosa under these conditions can be separated and bleeding surfaces can be repaired by fine suture.

Occlusion of the Abdominal Ostium.—When the abdominal ostium of a tube is closed it is not always easy to determine if an artificial ostium should be made or the tube excised. One or the other should be done as otherwise a sactosalpinx is almost certain to result. If it is improbable for the patient to become pregnant the tube should be excised. Such a tube should consequently be excised in women near, at, or after the menopause.

In deciding for excision or not of such a tube the personal equation of the patient should always be considered. If the patient has a chronic gonorrhœal endometritis the wisdom of making an artificial ostium is always questionable, as in such cases the tube is very liable to subsequent inflammatory changes and closure of the artificial opening.

Fig. 283

Method of making a new abdominal ostium of a Fallopian tube.

There is no especial indication for the formation of an artificial ostium if the other tube is apparently healthy. An artificial abdominal ostium should not be made if the tube contains a purulent secretion or if it is the site of advanced inflammatory changes.

The advantage of an artificial ostium is that it makes reproduction possible. The objections to the operation are that such tubes are frequently the location of inflammatory disease which may subsequently cause much suffering, that may close the artificial opening, and may necessitate excision of the tube. In cases of hydrosalpinx it is seldom advisable to make an artificial abdominal ostium, as in these cases the changes in the mucosa are almost certain to cause sterility. A vaginal or an abdominal cœliotomy is the treatment for sterility in cases where the probable diagnosis is occlusion of the abdominal ostia.

The technique of the formation of an artificial ostium consists in:

1. Separation of adhesions.

2. Incision into the tubal canal at its outer end along the dorsal surface for a distance of at least one inch. The incision is made along the

dorsal surface, as it is the most accessable and is less supplied with bloodvessels than other portions of the tube. A long incision is made as the sutures close part of the wound, and to guard against a subsequent occlusion of the tube.

3. Suture of the wound.

The mucosa and serosa of the tube are united by suture to prevent closure of the wound. The sutures should be so placed as to cause eversion of the mucosa. Eversion of the mucosa guards against closure of the wound and facilitates pregnancy (Fig. 283).

The end of the tube is sutured to the ovary if the fimbria ovariaca is absent.

Results as Regards Pregnancy.—Goffe[1] reported three pregnancies following separation of tubal and ovarian adhesions out of four cases operated on for this condition. I have done the operation in numerous instances but know of only one case where pregnancy resulted. The patient had been married a number of years. An abortion had been produced soon after marriage and had caused a "pelvic inflammation." Sterility dated from the abortion. The patient complained of no other symptoms and pelvic examination revealed no pathological condition. Examination of the husband showed that the semen was normal and the urethra free from disease.

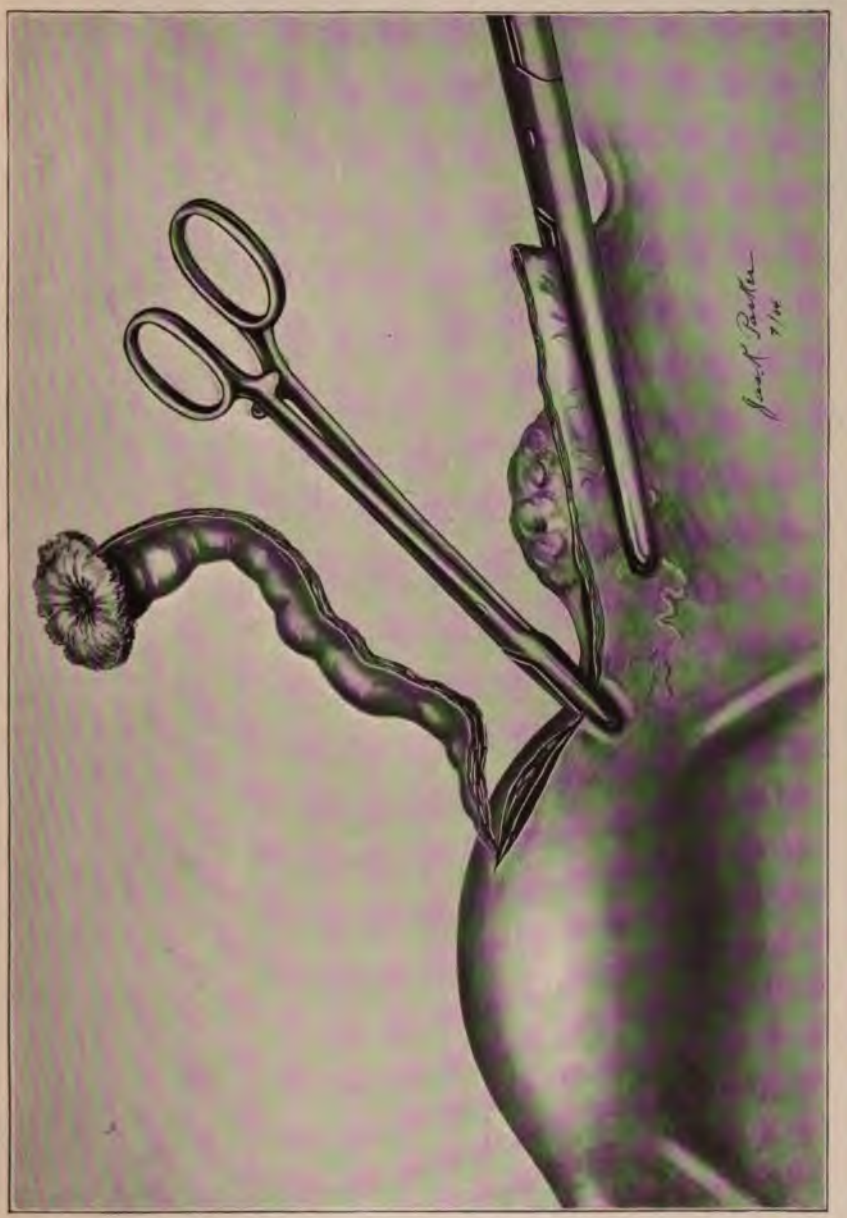
An exploratory vaginal cœliotomy revealed adhesions of both tubes and ovaries and occlusion of both abdominal ostia of the tubes. The adhesions were separated and an artificial ostium was made in each tube. The patient became pregnant about one and one-half years after operation. Gestation and labor were normal and she is now the happy mother of a healthy child. Most of my operations were made upon hospital patients where the subsequent histories could not be followed, so that the remote results in all of the cases cannot be given.

Excision of a Portion of the Tube.—This operation may be done when the distal portion of the tube is diseased and the proximal part of the tube is or seems healthy. It may preserve reproduction, and the indications are the same as for the formation of an ostium in an occluded tube. A nodular disease in the distal portion of the tube may be treated this way. The operation consists in excision of enough of the outer end of the tube to remove all of the diseased tissue. The tube is then slit up along the dorsum so as to increase the size of the ostium. The mucosa and serosa are sutured together in much the same manner as for the formation of a tubal ostium.

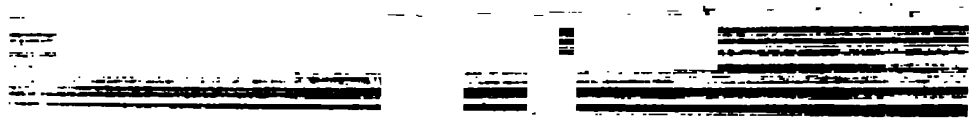
In two cases the writer has excised nodules in the tube and has made an end-to-end anastomosis, but he has abandoned the end-to-end anastomosis for excision of the distal portion of the tube. An end-to-end anastomosis is unsatisfactory on account of the small calibre of the tubal canal. There is no doubt but that pregnancy is possible through an amputated tube, as there are three or four cases reported where pregnancy occurred after both tubes had been excised close to the uterus.

[1] Journal of the American Medical Association, August 23, 1902.

PLATE LIV.



An eight-inch forceps controls the ovarian artery. The meso-salpinx is incised. A small artery forceps is placed on the uterine artery.



TUBOUTERINE ANASTOMOSIS.—This operation the author first did in 1897, and the operation was reported by Ries in the *Journal of Experimental Medicine* in 1897, and later by himself in the *American Gynecological and Obstetrical Journal*, September, 1897. The operation is adapted for cases where the isthmic or interstitial portion of the tube is alone affected. These cases are almost limited to those of salpingitis isthmica nodosa. The operation consists in excising the diseased portion of the tube and its entire interstitial part. This should be so done that the uterine cavity will be freely opened and the wound made large enough to insert the cut end of the tube into it. The cut end of the tube is now inserted into the uterine wound and held there by sutures passed from the surface of the tube to the surface of the uterus. These sutures should completely close the uterine wound about the tube.

In the first case in which this operation was done the patient became pregnant three months after leaving the hospital. She miscarried (induced) between the third and fourth month of gestation. The pregnancy occurred through the tube that had been inserted into the uterus, as the other tube was the seat of a pyosalpinx and was excised, and the opening into the uterus had been carefully closed by suture. We know of numerous cases where this operation has been done by the author and others, but know of no other case where pregnancy has resulted.

SALPINGECTOMY.—The indications for salpingectomy can be determined approximately by exclusion of cases for which other operations have been advised. The following are the chief indications for salpingectomy for infection of the Fallopian tubes:

1. *Pyosalpinx.*—It is never advisable to attempt plastic operations upon these tubes because they are almost certain to cause trouble later, and the pathological changes in the uterine ostium and in the mucosa are in themselves almost certain to cause sterility; that is, the probabilities of subsequent illness from them if not removed are much greater than the probabilities of pregnancy.

With a pyosalpinx on one side should the other tube be excised?

This is often a difficult question to answer, as many factors are involved. The factors to be considered are:

a. The condition of the other tube.

b. The nature of the infection.

c. The personal equation as regards the patient.

If the other tube is the seat of inflammatory nodules, or exudates, or adhesions that indicate its inability to preserve reproduction, or that suggests that it will continue to cause suffering, it should be removed. It should be remembered, however, that any of the plastic operations described may be used on such a tube with gratifying results.

If the pyosalpinx is gonorrhœal in origin it is more dangerous to attempt to preserve the other tube than if the infection were due to some other bacteria on account of the "latent" character of gonorrhœal infection. No attempt should be made to save one tube if a tuberculous

or malignant disease is present. One should remember that a unilateral salpingitis seldom occurs. The infection may, however, be severe on one and very slight on the other side. Both tubes, like both bronchi, are similarily exposed to infections.

If the patient has a chronic suppurative gonorrhœal endometritis it is seldom advisable to attempt to save the other tube, as the endometritis is almost certain to prevent or interrupt pregnancy and is very liable to ultimately affect the other tube. If the husband is sterile the other tube should usually be removed. The age of the patient, her desire to have children, her social position as regards dangers of subsequent infections, etc., should be considered in determining whether or not the other tube should be removed.

2. *Hydrosalpinx.*—If the hydrosalpinx is of any considerable size it is useless to attempt to preserve the tube, as its ability to functionate is in all probability destroyed. With hydrosalpinx there is no indication for removal of the other tube if it is perfectly healthy. If it is diseased one should determine what should be done with it, chiefly by the amount and character of its pathological changes and partially by the probability and desirability of pregnancy.

3. *When the Ovaries are Excised.*—If both ovaries have to be excised there is no object in leaving the tubes, and a double salpingectomy should be done if there is a history or signs of a salpingitis. There is, however, no indication for the removal of a perfectly healthy tube if the corresponding ovary is excised in the absence of a pelvic infection.

Technique of Salpingectomy.—The tube should be removed without a pedicle.[1]

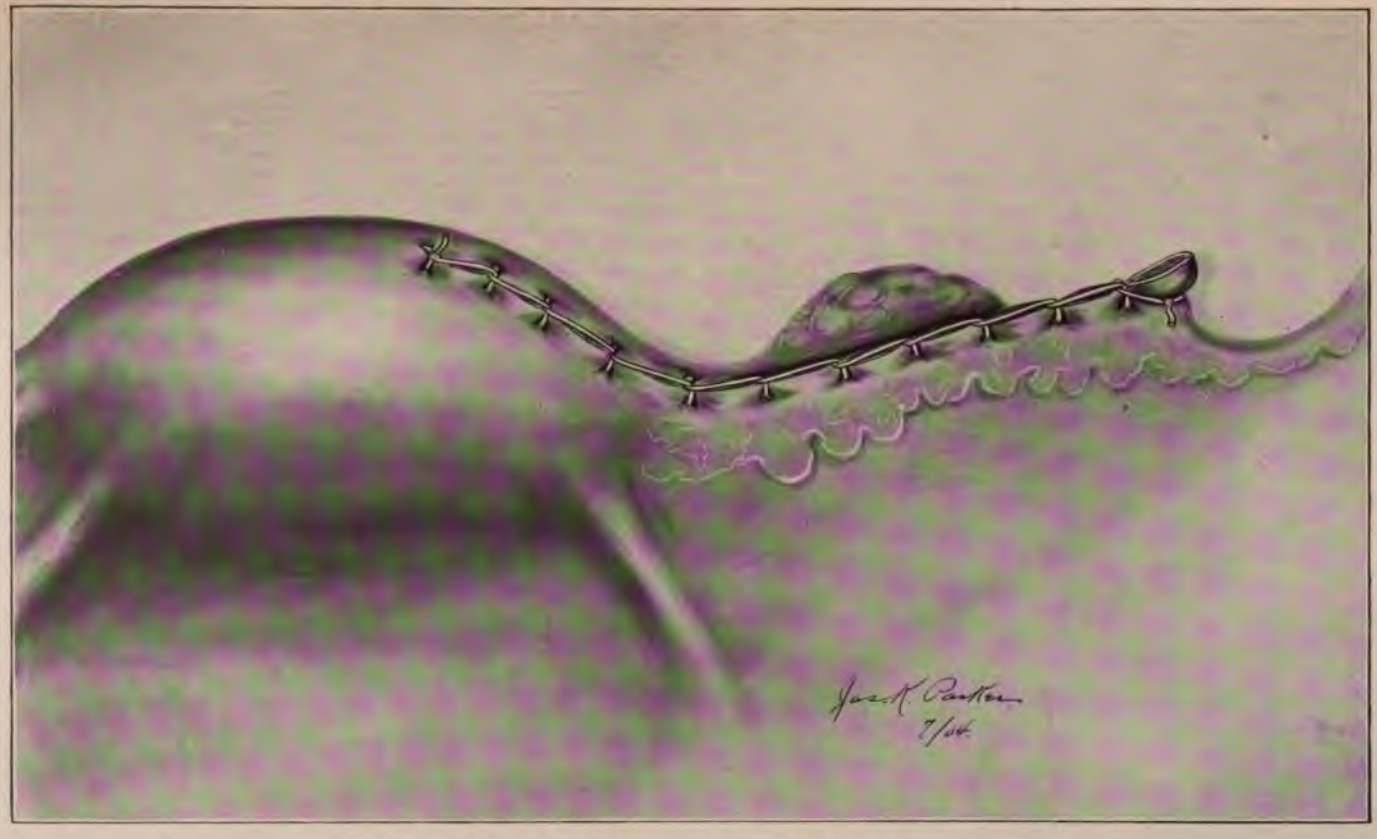
The advantages of suture of the broad ligament over the "pedicle operation" have been so thoroughly established that it would be useless to enumerate them here.

The operation in brief consists in the excision of the entire tube including the interstitial portion, if diseased, and the control of hemorrhage and suture of the wound in much the same manner as is practised in the treatment of any wound. As the technique varies somewhat in abdominal and vaginal salpingectomy the technique of the two operations will be given separately.

Technique of Abdominal Salpingectomy.—The usual preparations should be made as described elsewhere. One should, however, guard against weakening the patient by a too-restricted diet; depletion by too much catharsis, and irritation of the site of operation by too rigid preparation. The operator and all his assistants should wear rubber gloves (without punctures). One who cannot do abdominal operations without cutting, tearing, or puncturing gloves should practice operative surgery on the cadaver or on animals. The Trendelenburg position is always preferred. The usual median abdominal incision is made. It is well to have this incision extend nearly to the pubes, as a low incision

[1] Watkins, American Journal of Obstetrics, August, 1895. Pénrose, ibid. Polk, Clinical Gynecology, 1905. Watkins, Transactions of the American Gynecological Society, 1896.

PLATE LV.



Suture of the broad ligament, with the glover's stitch.

gives better access to the broad ligaments. The length of the wound should vary with the pathological changes encountered and with the dexterity of the operator. The wound should always be long enough to give easy access to the field of operation. There is a slight advantage in splitting one of the recti muscles. The peritoneum need not be incised as near to the pubes as the fascia, as the peritoneum is easily stretched. The general abdominal is thoroughly "walled off" from the pelvic cavity by the free use of large sponges or preferably by a long strip of wide gauze if there is any danger of leakage of pus into the peritoneal cavity. There is, however, very little injury from the leakage of pus in the peritoneal cavity in afebrile cases, as the pus in these cases is usually sterile. Moist gauze produces less irritation than dry gauze.

All omental adhesions in the pelvis should be separated and the omentum "walled off" from the field of operation. The adhesions are usually separated with ease when the "line of cleavage" is found. This line can usually be determined, as a rule, only by experience, and is much more readily found by touch than by sight. The use of gauze over the fingers is often very useful in the separation of adhesions. Portions of the omentum if the site of suppuration or extensive cellular infiltration should be excised.

One should now by inspection and palpation determine the character and extent of the pathological changes.

The method pursued in the separation of adhesions of the uterus, tubes, ovaries, and intestines is of extreme importance and determines to a large extent the dangers and duration of the operation. The following is the method which we advise:

1. Locate the uterus, and in a severe case grasp it by the fundus with a volsellum forceps and separate all adhesions to the posterior surface of uterus, using care to reach the bottom of Douglas' cul-de-sac, and in separating the adhesions to exert all of the pressure against the uterus so as to minimize the danger of injury of other adherent organs. It is much better to remove some of the peritoneum from the uterus than to risk injury of an adherent loop of intestine. The separation of these adhesions has to often be chiefly done by touch without the aid of sight.

2. By means of touch the "line of cleavage" between the diseased tube and the posterior surface of the broad ligament can generally be found and the adhesions between the two separated. This may leave the abdominal end of the tube still adherent and one or more loops of intestine may be adherent to the tube or to an inflammatory mass including the tube.

3. The tube can now be better exposed to sight. The technique may now vary with the pathological conditions present. The next step should consist in the separation of the adhesions to the abdominal end of the tube or in freeing the uterine end of the tube by means of an incision through the tube and through a portion of the mesosalpinx near the uterus. The former method is selected if the adhesions are not extremely firm and if the amount of pus is small. Otherwise the latter method is the better one to follow. If the abdominal end is loosened the

tube can be delivered through the abdominal incision so that any intestinal adhesions which are present are exposed to sight and can be separated without much danger of injury of an intestine. The distal portion of the broad ligament is now grasped with an eight-inch forceps, which temporarily controls the blood supply from the ovarian artery. This forceps is placed under or above the ovary depending upon removal or not of the ovary. The mesosalpinx is now incised throughout its entire extent as near the tube as is consistent with the removal of all of the diseased tissue. A small artery forceps is placed on the cut surface of the broad ligament which contains the uterine artery. The tube is separated

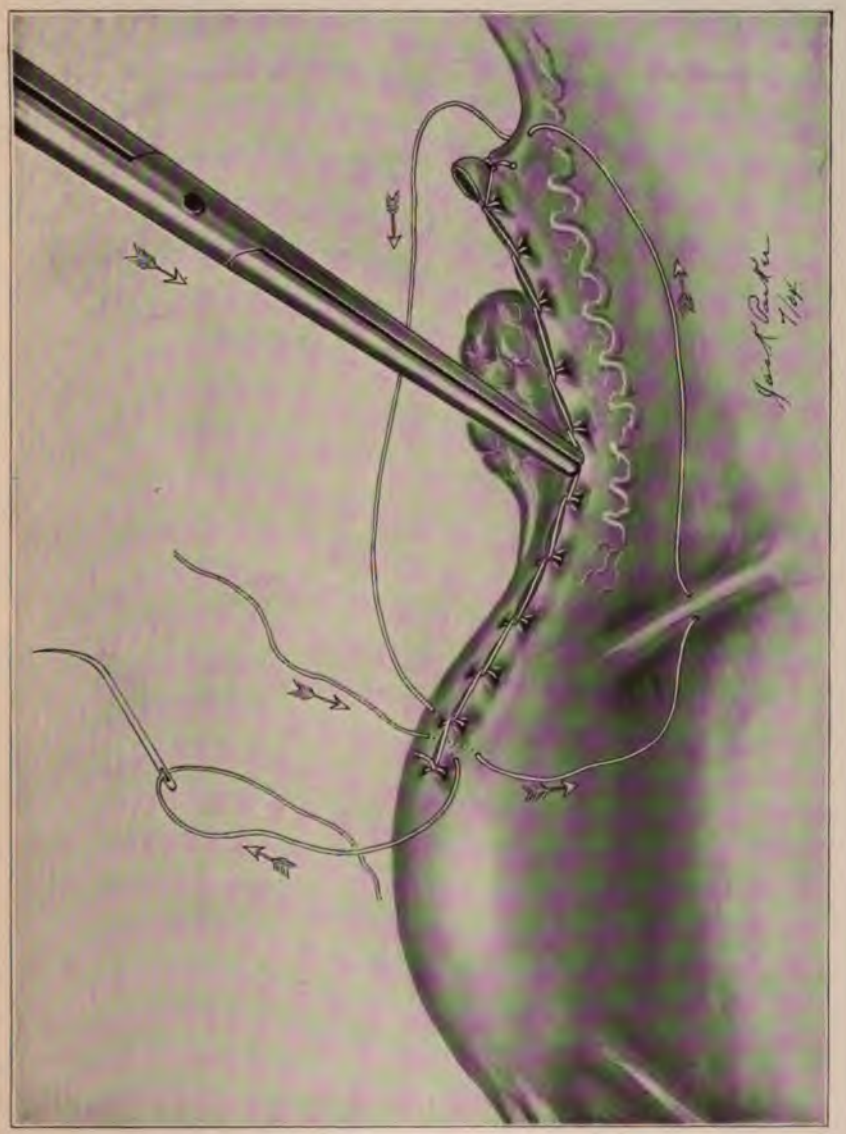
FIG. 284

A suture for shortening the broad ligament which buries the entire wound.

from the uterus by a V-shaped incision into the uterus and this incision should be deep enough to include all of the diseased tube.

If excision of the tube is commenced at the uterine end the tube is cut out of the uterus by a V-shaped incision; bleeding from the cut end of the uterine artery is stopped by an artery forceps. An eight-inch clamp is now placed on the mesosalpinx close to the tube from the incision outward as far as the broad ligament, is free from adhesions, and the broad ligament between the forceps and tube is divided. This

PLATE LVI.



As this ligature is pulled taught an assistant exerts pressure upon the median portion of the wound.

will give easy access to any tubointestinal adhesion and usually facilitates very much separation of the very firm adhesions about the fimbriated end of the tube. By this method the dangers of rupture of the tube are lessened.

The hemorrhage is permanently controlled by carrying ligatures about the ovarian and uterine arteries. This can be readily done by arming the ligature with a needle. As the ligature is tied an assistant should remove the forceps, as the forceps would otherwise prevent firm ligation of the artery.

The bleeding may also be controlled by suture of the broad ligament wound with a glover's stitch. No. 1 catgut is usually strong enough for this purpose. This suture not only gives perfect hæmostasis, but also covers over all of the raw surface in the broad ligament wound by approximation of the peritoneum of the anterior to the peritoneum of the posterior surface of the ligament. Observation of the results from this operation in numerous cases convinced the author that it did not restore the normal support to the uterus. This led him to devise a suture for shortening the broad ligament and which incidentally buries the entire wound in somewhat the same manner as the stump of the appendix is buried. The suture is first passed through the horn of the uterus, through the round ligament, through the infundibulopelvic ligament, and finally through the uterine cornea again. As this ligature is pulled tight an assistant exerts pressure upon the median portion of the wound. If the wound is especially difficult to bury the suture may include a small portion of the peritoneum of the anterior and posterior surfaces of the broad ligament. The dangers of retroposition of the uterus recurring may be lessened by also using a puckering suture in each round ligament (Fig. 284).

If the uterus is very much enlarged and if much denuded surface remains posterior to the uterus, it may be advisable to still further guard against retroposition of the uterus. This can be done by making a pouch-shaped

FIG. 285

Showing two ligaments of actual length and size which were found extending from the uterus to the abdominal wall two years after an operation of ventral suspension of the uterus.

wound in the uterovesical space into which the fundus of the uterus is placed and sutured. This is accomplished by incising the peritoneum transversely in the uterovesical space and by dissecting with the fingers enough of the peritoneum to extend over the fundus. The peritoneal wound is closed with a fine catgut suture. This peritoneum readily stretches in case of pregnancy and causes no vesical symptoms. This

FIG. 286

Dissecting with the fingers enough of the peritoneum to extend over the fundus.

method of treatment of retroposition of the uterus has given such good results that we have discarded ventral suspension, as ventral suspension is always temporary in effect and the ligaments which it produces are always a source of danger (Figs. 285, 286, 287, 288, 289).

Should the uterus be removed in cases of double salpingectomy? Seldom or never unless it is the seat of a disease which indicates its removal. It is usually unjustifiable to remove the uterus in young

women if sufficient ovarian tissue can be saved to preserve the menstrual function. In nearly all cases of salpingitis this can be done. In women near, at, or after the menopause and in cases of double oöphorectomy the uterus should be removed if it is so diseased that it may complicate recovery from the operation or produce symptoms after the operation. In desperate suppurative cases it may be removed to facilitate drainage.

Toilette of the Peritoneum.—The peritoneal cavity should now be thoroughly inspected for hemorrhage, and all bleeding points should be either ligated or sutured. Any rents that may be found in the omentum should be closed by suture. All denuded surfaces should as far as possible be covered with peritoneum or omentum.

FIG. 287

A joint-shaped wound in the uterovesical space.

The peritoneal cavity should never be irrigated unless there is present a general suppurative peritonitis. In localized suppurations irrigations may disseminate the infection and thus do much harm. In cases that are not drained the abdominal cavity may be filled with hot normal saline solution if stimulation is indicated. The appendix should be examined and removed if there is a suspicion that it is diseased.

Drainage.—We believe that it is a conservative statement to make that drainage through the abdominal incision is only of interest as a matter of history.

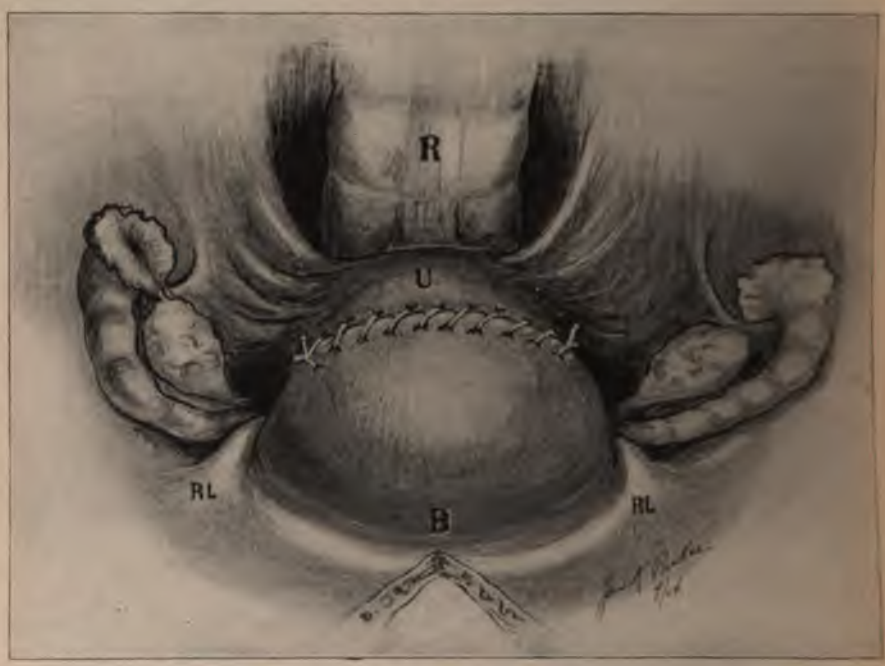
Drainage through an abdominal incision for pelvic disease is always defective, as it is resisted by gravity. The drainage nearly always causes

more or less suppuration in the wound, and in a very large percentage of the cases (probably 50 per cent.) hernia results. Drainage through the abdominal wound also increases the danger of intestinal adhesions with all of their consequent complications.

The conclusion, therefore, is that drainage for pelvic disease in gynecological cases, when used, should be established per vaginam.

INDICATIONS FOR DRAINAGE.—All non-septic afebrile cases can be excluded, except a very few of them, where there is danger of an intestinal or ureteral fistula resulting. One should not mistake the use of gauze to stop hemorrhage for drainage. The presence of pus or the

FIG. 288



The peritoneal wound is closed with a fine catgut suture.

leakage of pus into the peritoneal cavity is no indication for drainage, as the pus is often sterile.

1. All of the cases with general suppurative peritonitis should be drained.

2. All septic cases with necrotic tissue, with extensive inflammatory exudates, and with much denuded surface should be drained.

3. All cases where a ureter or an intestine has been injured, that may cause a fistula, should be drained.

One should not expect too much from drainage. The bacteria or toxins in the blood or lymphatic circulation or in the tissue can be affected little or not at all by the use of drainage. The chief value of

drainage is to prevent the accumulation of serum or pus about infected tissue and to thus diminish the amount of toxins which become absorbed. The use of drainage on suppurating surfaces and on necrotic surfaces, that are very liable to suppurate, probably diminishes the suppuration and lessens the amount of pus that is absorbed.

Gauze is usually preferred to a tube for vaginal drainage. A rubber tube covered with gauze may be used. The amount of gauze used should usually be as little as will prevent the accumulation of serum. If there is a suppurating surface or much necrotic tissue enough gauze should be used to cover these surfaces. Iodoform gauze is generally

FIG. 289

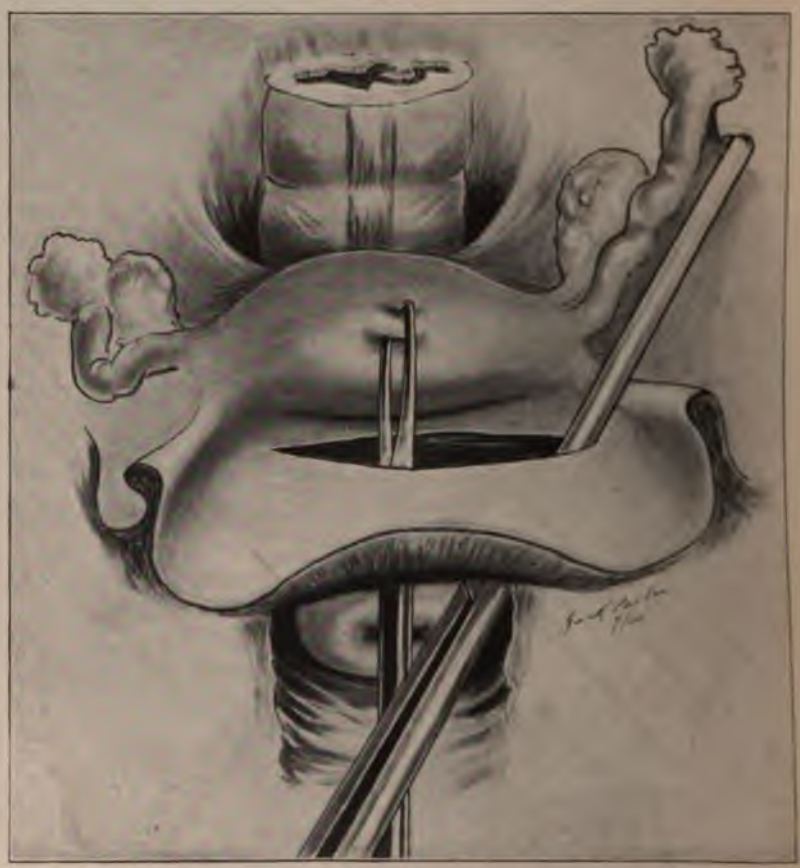
This peritoneum readily stretches in case of pregnancy.

used, as it becomes less offensive than sterile gauze and has a beneficial effect upon suppurating and necrotic tissue. There is, however, always danger of iodoform poisoning from its use, and it is possible that the dangers from iodoform exceed its benefits. In the use of gauze one should be careful to insert it so that it does not obstruct instead of facilitate drainage.

The gauze drain is inserted as follows: A strip of gauze drainage of desired length, two or three inches wide, is placed in layers from side to side, posterior to the uterus. After the abdominal incision is closed and dressed the patient is placed in the lithotomy position, the vagina cleansed, if it has not been done, and a posterior cervical section is made in the usual manner. The lower end of

the gauze is grasped and drawn into the vagina. This method is preferred to puncture through the posterior vaginal fornix before the abdominal wound is closed, as it lessens the dangers of infection. The

FIG. 290



One blade of the forceps punctures the broad ligament under the tube near the uterus. This figure is not made to illustrate how the uterus and adnexa are delivered into the vagina, but to show the application of the forceps.

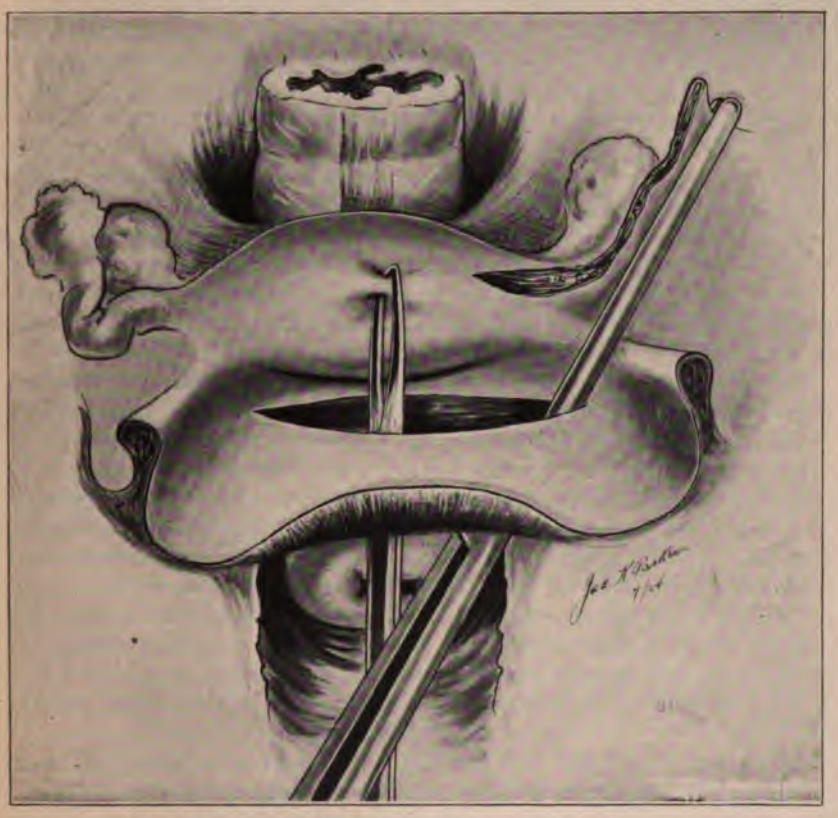
drain is removed in twenty-four to forty-eight hours or in four or five or eight days, as described under Vaginal Section and Drainage, depending upon the tissue drained as regards suppuration, necrosis, inflammatory exudates, etc.

PUERPERAL INFECTION OF THE FALLOPIAN TUBES.

Puerperal infection of the Fallopian tubes occurs relatively much less frequently than non-puerperal infections of the tubes. Puerperal infec-

tion extends through the lymph and bloodvessels more commonly than by continuity of tissue, and consequently involves the ovaries and connective tissue of the broad ligaments more often than the Fallopian tubes. Puerperal infection of the tubes is probably more common than is generally believed, as many of them must terminate fatally without a diagnosis as to the tubal involvement, and many of the cases result in a spontaneous and complete cure without having been diagnosed.

FIG. 291



The tube is now excised, including as much of the interstitial portion as is diseased.

It is probable that every case of puerperal metritis has a salpingitis, but the salpingitis may be so mild as to produce no symptoms or leave no pathological changes. The infection may be so virulent as to mask all signs and symptoms of salpingitis. In all cases of puerperal peritonitis the serosa of the tube is at least involved.

Etiology.—The disease is usually the result of an extension of an infection from a septic uterus, and is generally the result of a faulty technique in the management of labor or in the care during the puer-

perium, and comprises the entire subject of the etiology of puerperal infections.

The disease is at times the result of an old gonorrhœal infection in the endometrium or Fallopian tubes. Numerous cases are on record in which there is no doubt that an acute puerperal salpingitis resulted from a chronic gonorrhœal salpingitis. A gonorrhœal puerperal salpingitis may also result from a chronic gonorrhœa of the vulva or from an acute gonorrhœal infection.

Salpingitis is more common in abortions than labors, as the former are more often septic than the latter.

Pathology.—The pathology of puerperal and non-puerperal infections is much the same, except the infection is often more virulent in the former than in the latter and the resistance to infection is less in the former than in the latter. In puerperal cases the infection travels more by the blood and lymph vessels than by continuity of tissue, and consequently the tubal infection frequently commences about these vessels, is secondary to a cellular inflammation in the broad ligaments or to an ovaritis or pelvic peritonitis. An inflammatory nodule is occasionally found in the tubal wall without involvement of the tubal mucosa.

It is probable that the tubes occasionally drain into the uterus in puerperal cases, as the canal of the interstitial portion of the tube is much increased in size in the puerperium.

Puerperal salpingitis more often results in spontaneous complete recovery than non-puerperal, as gonorrhœal infections are relatively much less common in the former than in the latter.

Symptomatology. SUBJECTIVE.—In extremely virulent cases the subjective symptoms may be masked by the severity of the infection. The onset of the disease is usually rather acute, frequently commences with pain in the region of one or both tubes, but nearly always more acute on one than on the other side. Chills are more common in puerperal than in non-puerperal, and the febrile disturbance is usually more marked in the former than in the latter. The amount of pain is often less in puerperal than in non-puerperal, as the amount of tension is less, and severe general septicæmia is more common in the former than in the latter.

As in non-puerperal infections the subjective symptoms will vary much with the virulence and extent of the infection and with the resistance to the infection. The subjective symptoms will also vary much with the temperament of the patient.

OBJECTIVE.—The objective symptoms of acute puerperal salpingitis are much less evident than in non-puerperal salpingitis. The causes for this are the presence of the enlarged soft uterus and the frequency of peritonitis with much involvement of the intestines.

Tenderness is always present and is always higher in the pelvis than in non-puerperal cases on account of the presence of the large uterus. The tenderness is not often found in Douglas' cul-de-sac for the same reason. Swelling is found if there is much exudate about the tube, otherwise it is difficult to detect.

The swelling is often felt as a board-like exudate along the base of the broad ligaments, parallel and above Poupart's ligament, and may be found above the crest of the ilium as a result of a coincident inflammatory exudate in the broad ligament. Inflammatory residues will usually not be found about the vulva, urethra, and cervix unless the patient has had a gonorrhœal infection. The uterus will usually be found more or less diminished in mobility, sensitive, and pushed or drawn to one side. Coils of intestines are usually visible as a result of intestinal adhesions.

Diagnosis.—The symptomatology of chronic puerperal salpingitis is much the same as in chronic non-puerperal salpingitis. The diagnosis is much more difficult to make in acute puerperal than in non-puerperal cases on account of the presence of the large uterus and because a cellulitis may be present in the broad ligament with little or no involvement of the tubes, and the patient may have a peritonitis with only a serous inflammation of the tubes.

Salpingitis can be excluded by eliminating a peritonitis, as in all cases of puerperal salpingitis there is always more or less peritonitis. As a general proposition the absence of pain and tenderness in the pelvis means the absence of a salpingitis. In cases of puerperal infection with general or local peritonitis it is usually difficult to determine the presence or not of a salpingitis, and in many cases it is impossible to do so without an exploratory incision. With the presence of pain, tenderness in the pelvis, and a febrile condition one should endeavor to find out whether there is a swelling or exudate in the pelvis besides the puerperal uterus or not. This can generally be done by an abdominal palpation aided by a combined vaginoabdominal examination. If a swelling is found to the side or behind the uterus one should consider the possibility that it may have antedated the puerperal infection. If a swelling is present which has occurred after a puerperal infection it is usually the result of an infection of the tubes, ovaries, or broad ligaments.

Differential diagnosis between a puerperal salpingitis and a cellulitis in the broad ligament: This is usually difficult to make as the two conditions are often present and may produce like subjective and objective symptoms. The contour of the enlargement may be unlike, as with a salpingitis the swelling is in the region of the upper border of the broad ligament and frequently appears to be cylindrical or ovoid in shape. With a broad-ligament cellulitis the exudate is nearly always felt along the base of the broad ligament, and on abdominal palpation parallel and close to Poupart's ligament, and the mass seldom has well-defined borders.

Differential diagnosis between infection of the tubes and ovaries will be considered under infection of the ovaries. In cases of general puerperal peritonitis it is usually impossible to determine without an anæsthetic whether there is an inflammatory exudate or not in the pelvis on account of the tenderness and distention of the abdomen.

Prognosis.—The prognosis varies much with different cases, but is always serious as peritoneal involvement in puerperal infections is

always dangerous. Recovery, however, frequently takes place and the recovery is often spontaneous and complete.

The prognosis is worse as regards mortality in puerperal than in non-puerperal salpingitis on account of the presence of the septic uterus and the more frequent involvement of the lymph and bloodvessels in the former than in the latter. As regards recovery without operation, however, the prognosis is better in puerperal than in non-puerperal cases.

The prognosis is, as a rule, more favorable in cases where the disease has existed a few days than in recent cases, as the virulence of the infection tends to become less and less and the deposit of inflammatory exudate lessens the rapidity of absorption.

Treatment.—The non-operative and operative treatment is the same as in non-puerperal salpingitis. The indications for treatment, however, differ in the two conditions. It should be remembered that complete spontaneous recoveries are more common in puerperal than non-puerperal cases, and the former are worse subjects for operation than the latter.

Non-operative treatment should be persisted in when the tendency for the disease is to improve. A daily diminution in the white blood count is a very favorable symptom.

Incision and Drainage.—Incision and drainage are indicated when an abscess can be detected in close proximity to the vagina or abdominal wall. Vaginal section is indicated whenever the disease tends to become worse or when improvement ceases, especially if there is peritoneal involvement.

In all unfavorable cases we believe that an exploratory vaginal section is good treatment. This may reveal a suppuration that may not otherwise be found, or a condition may be revealed that will indicate a radical operation. In most cases with suppuration incision and drainage will give a lower mortality than a radical operation and will not sacrifice any organs.

In cases of extensive exudate without suppuration there is no evidence to show that incision and drainage is of any special advantage and may cause suppuration which might otherwise not result. Some cases of puerperal pelvic abscesses are best treated by an incision parallel to and a little above Poupart's ligament.

Radical Operations.—Radical operations should usually not be done, as most cases that require operation are better treated by incision and drainage than by removal of any organs. It is questionable if radical operations are ever indicated during the febrile period of puerperal salpingitis on account of the high mortality that attends such operations. Where the cases become afebrile the indications are the same as for non-puerperal salpingitis. Hysterosalpingo-oöphorectomy for puerperal salpingitis has received much less attention than it did some years ago and indicates that the results are unfavorable. Gonorrhœal puerperal salpingitis eventually requires operative treatment, and when the disease becomes chronic is treated as described under non-

puerperal salpingitis. One should remember that in many cases of puerperal infection there are few or no pelvic manifestations of the disease and that with a salpingitis the lymphatic involvement may be the principal factor in the disease. The treatment of chronic puerperal salpingitis is similar to the treatment of non-puerperal salpingitis; most cases of chronic puerperal salpingitis are gonorrhœal.

TUBERCULOSIS OF THE FALLOPIAN TUBES.

Frequency.—The Fallopian tube is more often affected by tuberculosis than any of the other female genital organs. The probable reasons for this are the numerous folds of the mucosa and the many convolutions of the Fallopian tubes.

The frequency of the disease is indicated by the following statistics: Winckel found among 575 necropsies 5 cases of tuberculosis of the tubes; Donhoff found among 509 necropsies 14 cases of tuberculosis of the tubes; Schramm found among 3386 necropsies 34 cases of tuberculosis of the tubes; Williams found among 91 cases of salpingitis 7 cases of tuberculosis of the tubes; Rosthorn found among 103 cases of salpingitis 5 cases of tuberculosis of the tubes; Menge found among 70 cases of pyosalpinx 7 cases of tuberculosis of the tubes; Hausemann found among 7000 necropsies 18 cases of tuberculosis of the genital organs.

The relative frequency of tuberculosis of the various pelvic organs is illustrated by the following statistics: One tube was affected in 65 per cent. of the cases; both tubes were affected in 59 per cent. of the cases; tube and uterus were affected in 29 per cent. of the cases; tube, uterus, and ovary were affected in 13 per cent. of the cases; uterus and ovary each were affected in 1 per cent. of the cases.

The disease is divided into: *a.* Primary tuberculosis. *b.* Secondary tuberculosis.

Primary tuberculosis seldom or never occurs. We speak of primary tuberculosis when we can exclude tuberculosis or residues of it in any of the other organs which might have caused the tubal tuberculosis. One should remember, however, that in cases of primary tubal tuberculosis secondary tuberculosis may occur in other organs.

A clinical diagnosis of primary tuberculosis is of no value, as tuberculosis or residues of tuberculosis in other parts of the body cannot be excluded without a very complete and careful necropsy.

Recovery after the removal of tuberculous tubes does not necessarily mean that the disease was primary, as spontaneous recovery of tuberculosis in various parts of the body is not uncommon. The tuberculous disease which produced the tubal infection may disappear or become dormant before the patient appears for treatment of the tubal tuberculosis. A careful study of all reported cases of primary tubal tuberculosis that are not congenital, shows that a previous tuberculosis in some other part of the body was not positively excluded, and therefore they should be considered as the result of a secondary infection.

Primary tuberculosis of the Fallopian tubes may be congenital. Cases of this kind, especially in children, are reported, and the possibility of such an occurrence has been proven by experiments. The transmission of tubercle bacilli through the placenta to the fetus has been observed. Schmorl, Hirschfeld, and Friedman believe, and their belief is supported by observations, that tuberculosis of the father can be transmitted to the fetus without infecting the mother.

Boveri's contributions make it seem plausible that congenital infection may occur at the time of the first segmentation of the ovum. In cases of congenital origin all of the organs of the fetus can be affected and it is a chance if only the tubes are involved. Children with congenital tuberculosis usually die young.

Oppenheim found among 49 cases of tuberculosis of the genital organs three of the cases were children; Wolff among 72 cases of tuberculosis of the tube eight young children, but Müller only one child among 150 cases.

Etiology of Tuberculosis of the Fallopian Tubes.—Primary tuberculosis of the Fallopian tubes may be congenital or may be the result of an infection with tubercle bacilli from examination, masturbation, traumatism, or coitus. The infection may take place in a small wound of the vulva or vagina, produce a tuberculosis, and then produce secondarily a tuberculosis of the Fallopian tube. The tubercle bacilli may, however, gain access to the body through a small wound without even infecting the wound, be carried through the lymphatics to the Fallopian tubes, and produce a primary tubal tuberculosis. Such an occurrence is generally believed as possible, but is very improbable and hard to prove.

Tubercle bacilli may penetrate the healthy mucosa of the cervix of the uterus or they may even reach the mucosa of the tubes and produce primary tuberculosis of the tube without infecting the uterus or cervix. By what means the bacilli are carried to the tubes is difficult to say. The explanation of some authors that the current of the sperma carries them along is hard to believe. While it is certain that tubercle bacilli are found in the sperma of men that suffer from genital tuberculosis and even from tuberculosis of the lungs or other organs without involvement of the genital organs, and while there are cases which show that coitus is a source of tuberculosis of the female generative organs, we are nevertheless of the belief that this mode of infection, especially of the tubes, is very much less frequent than is generally believed.

The frequency of tuberculosis in man and the presence of tubercle bacilli in the semen is certainly in contrast with the comparatively few cases of tuberculosis of the female genital organs. We are inclined to believe with Amann that the majority of cases reported as primary tuberculosis of the tubes infected by coitus are secondary. When the husband has a pulmonary tuberculosis the wife is much more liable to get an infection from inhaling contaminated air which may cause an infection in the cervical or peribronchial glands, etc., than she is to get a tubal tuberculosis from coitus.

It should not be forgotten that Schmorl, Bollinger, and Reckling-

hausen state that among all of their postmortem examinations they never saw a case of primary tuberculosis of the tube, but that they have found in all the so-called primary cases tuberculosis of other organs from which the infection of the tube may have occurred. It is also important to remember that the retroperitoneal and inguinal glands are very seldom affected, a fact that certainly supports our opinion.

In cases of infection with tubercle bacilli by coitus we have to divide the hetero from the autoinfection.

The secondary form of tuberculosis of the tube means that the infection occurred from another tuberculous organ of the body. The infection may be metastatic (hæmatogenous), and this is the most common mode of infection. By inhalation the cervical and peribronchial lymphatic glands may become infected; rupture of these glands may occur into a vessel and metastases may result in tubal tuberculosis.

Infection may also occur by means of the lymphatic vessels and by contiguity of tissue. Extension by contiguity is, however, in most cases nothing but extension by lymph vessels. Infection of the Fallopian tube from the intestines probably occurs quite frequently. It may take place through the bloodvessels, through the lymphatics, or by contiguity of tissue. In these latter cases the peritoneum may become primarily and the tube secondarily infected, or the tube may become infected first and the peritoneum later. The opinions of authors concerning tuberculous peritonitis are very different. Some believe that the tuberculosis of the peritoneum is usually secondary to tuberculosis of the tube. Others believe that tuberculosis of the tube generally results from tuberculosis of the peritoneum. Amann says that the latter method of infection seldom occurs.

The following statistics illustrate the difficulties in determining the relation of tuberculous peritonitis to tuberculosis of the tube:

Mayer found among 194 cases of secondary tuberculosis of the tubes 110 with tuberculous peritonitis. Another author reports 33 cases of tuberculous peritonitis with the tubes perfectly normal. There are cases reported where the peritoneum shows a tuberculous process far advanced and where the Fallopian tube shows the disease just beginning in the ampullary part, but Murphy and ourselves each observed a case of tuberculosis of the tube where the peritoneum showed tuberculous changes only in the part surrounding the ampulla. It is certain that in many cases of tuberculosis of the tube the peritoneum is also affected.

Martin is of the opinion that the infection in cases of tuberculosis of the Fallopian tubes comes from the intestines in the majority of instances.

Mase's case of infection from the umbilicus illustrates how tuberculous salpingitis may result from infection through the lymph vessels.

All authors agree that hyperplasia, aplasia, dystrophic diseases, pregnancy, gonorrhœa, and syphilis predispose to tuberculosis of the Fallopian tubes.

Hegar's classification of ascending and descending tuberculosis of the Fallopian tubes is based upon the method of extension of the dis-

ease. Some authors contend that ascending tubal tuberculosis is primary tubal tuberculosis and that descending tubal tuberculosis is secondary tubal tuberculosis. This is an error, as both the ascending and descending varieties are usually if not invariably a secondary disease. The disease is in nearly half of the cases bilateral, but the intensity of the process may differ in both tubes considerably.

FIG. 292

Tuberculous salpingitis, cross-section: *a*, tubercle; *b*, caseous mass; *c*, lumen of tube, with partial loss of epithelium.

Pathology. 1. ACUTE TUBERCULOUS SALPINGITIS. *a. Changes in the Secretion.*—In the beginning where the process resembles catarrhal salpingitis very much grayish or yellowish mucus is found; later on caseous detritus gives the pus its typical appearance. In the more advanced stages the caseous material fills the tube and tubercle bacilli are usually found in abundance.

b. Changes in the Mucosa.—At first the changes in the mucosa resemble those observed in catarrhal salpingitis. Later on round-cell infiltration, a few tubercles—epithelial and a few giant cells—are found in the mucosa. Early in the disease caseous degeneration of the tuberculous masses occurs and necrosis destroys large portions of the mucosa. If we remove the purulent or caseous exudate from the mucosa one may

observe small miliary nodules over the whole mucosa. These miliary tubercles frequently become confluent and form larger nodules, which soon degenerate to caseous masses and thus destroy the mucosa. The tubes become larger, stiff, indurated, nodular, and tortuous, depending largely upon the amount of inflammatory changes present. More or less pus collects in the tube and at the site of broken-down nodules.

c. Changes in the Musculature.—The amount of changes in the muscles will depend upon the duration, tuberculous nodules, and round-cell infiltration. Later miliary abscesses and caseous degeneration of the tuberculous tissue may occur and destroy parts of the muscular wall.

FIG. 293

Tuberculous Fallopian tube. (Dudley.)

d. Changes in the Serosa.—Infiltration of the peritoneum, fibrinous membranes, adhesions, and occlusion of the ostium may occur as in cases of purulent salpingitis, with the only difference that the ostium does not always become occluded. Sometimes a caseous plug occludes the abdominal ostium. Typical tubercles have been found on the serosa.

2. CHRONIC TUBERCULOUS SALPINGITIS.—*a. Changes in the exudate* are, to a certain extent, different in the chronic and the acute form of the disease. It consists largely of pus which is not so much mixed with caseous material. In very chronic cases the pus may become caseous in character, much of the serum is absorbed, and caseous degenerated tissue and epithelium are prevalent in the exudate. Few or no bacilli are found. The amount of exudate varies from a few drops to several ounces.

Orthman[1] found crystals of calcium carbonate in the exudate.

b. Changes in the Mucosa.—The folds of the mucosa are the site of tubercles, and about the tubercles are usually found many round cells. The folds are much swollen and agglutinate with each other, or are

[1] Virchow's Archiv, Bd. cviii. p. 165.

transformed into granulating tissue after destruction of the epithelium. Thus cysts are produced as in salpingitis pseudofollicularis. Landau and Stein describe columns of solid epithelium and cysts with atypical epithelium. The tubercles become increased in size and they are distinguished by an enormous amount of giant and epithelioid cells. The folds are sometimes converted into homogeneous masses. The disease may become confluent so that the masses consist only of tuberculous tissue. Later on it may be converted into caseous tissue, but the tendency for this is much less than in the acute form. In far-advanced cases in place of the mucosa may be found a small wall of tuberculous tissue, which may resemble in appearance a pyogenic membrane.

c. Changes in the Musculature.—Hegar has called attention to nodules in the muscles that he believes are characteristic of tuberculous salpingitis. These nodules are generally found in the isthmic portion of the tube, but may involve the entire tube and give it a beaded appearance. These nodules are not characteristic of tuberculosis, as will be seen later.

The musculature shows sooner or later inflammatory changes, but seldom regular tubercles. The muscular layer of the tube is thickened, and the thickening is principally due to hypertrophy.

d. Changes in the Serosa.—The serosa usually shows pronounced pathological changes. It is frequently studded with miliary tubercles and at times with tuberculous nodules. Portions of the serosa are frequently covered with fibrinous precipitates and numerous and firm adhesions to adjacent organs are usually present. The abdominal ostia are usually occluded and a purulent sactosalpinx frequently results, differing in size just as a non-tuberculous pyosalpinx.

As in all cases of inflammation of the serosa, with the formation of new membranes, cysts are found under the serosa or between it and adhesions. The cysts are lined with cells of the character of endothelium, or with cubical or cylindrical epithelium. Ries believes that most of these cysts are formed from the peritoneum and that the lining results from heterotopy of the endothelium. Other authors believe that those cysts are remnants of the Wolffian body or aberrant tubes, or are formed from the germinative epithelium. There are also found cysts from peritoneal adhesions, perisalpingitic abscesses, which do not communicate with the lumen of the tube.

Perforation of tuberculous pus tubes into other organs seldom occurs.

Williams[1] has described a variety of tuberculous salpingitis which has an extensive formation of connective tissue, few tubercles, and which shows no tendency to caseous degeneration.

Williams describes another variety of tuberculous salpingitis which he names "unsuspected tuberculosis." He includes in this variety cases which upon macroscopic examination do not look like tuberculosis, but are found to be tuberculous when subjected to a careful microscopic investigation.

[1] Johns Hopkins Records, 1892.

The Fallopian tube is usually the site of miliary tuberculosis in cases of general miliary tuberculosis.

The external appearance of a tuberculous pyosalpinx may resemble very much a gonorrhœic one; but the presence of tubercles in the serosa and, after opening the pus sac, the characteristic tuberculous pus and the changes in the mucosa will even make a macroscopic diagnosis of tuberculosis in most of the cases possible.

While, as we have seen, gonococci or streptococci and staphylococci disappear rather soon in gonorrhœic or septic salpingitis, the tubercle bacilli may, if encapsulated, remain for years and retain their virulence.

Symptomatology.—The symptoms vary much in different cases, probably as the result of the acuteness and extent of the infection. In exceptional cases the subjective symptoms may be nearly absent. The disease in this respect is like tuberculosis in other portions of the body. The symptoms are somewhat unlike those found in non-tuberculous salpingitis, as the tubercle bacilli usually remain for a long time in the tissues and produce continuous and progressive pathological changes, and consequently do not generally produce well-defined acute and chronic forms of the disease. As the disease is usually secondary to tuberculosis in some other organ of the body the primary tuberculosis frequently influences the symptomatology. Secondary involvement of other organs, especially the intestines and peritoneum, increases the number and severity of the symptoms. The pain is usually not so severe, but is generally more continuous than in acute non-tuberculous salpingitis. Periods of comparatively good health and a long duration of the disease are characteristic of some cases of tuberculous salpingitis.

The tenderness is usually greater than in chronic but less than in acute non-tuberculous salpingitis. Menorrhagia is generally present and dysmenorrhœa is often a pronounced symptom. If the disease has produced emaciation and exhaustion amenorrhœa may result.

Fever is usually present and is generally not as high as in acute non-tuberculous salpingitis, and is, as a rule, remittent in character. "Night sweats" often occur. Mixed infections and the amount of suppuration tend to increase the fever. Emaciation and loss of strength usually occur as from tuberculosis in any organ of the body.

Intestinal symptoms—as flatulency, colic, constipation, or diarrhœa—are frequently present, as in a number of cases the intestines are tuberculous. The swelling varies much in size, is usually hard, indurated, and seldom has a well-defined border, and usually produces marked fixation of the pelvic organs. In a few cases nodules can be palpated on conjoined palpation, which is a valuable diagnostic point. The blood changes are the same as in tuberculosis of other organs and may be valuable in distinguishing between tuberculous and non-tuberculous salpingitis. The symptomatology is changed if a perforation into another organ occurs.

Tuberculous disease may be found in other parts of the body.

The amount of peritoneal fluid is nearly always increased and ascites is frequently present.

Diagnosis.—It is not necessary to give the differential diagnosis between tuberculous salpingitis and the diseases of the other pelvic organs, as this is much the same as the differential diagnosis between non-tuberculous salpingitis and the diseases of the other pelvic organs.

Differential Diagnosis.—Differential diagnosis between *tuberculous* and *non-tuberculous salpingitis.*

HISTORY.

Tuberculous Salpingitis.	*Non-tuberculous Salpingitis.*
1. May be no history of infection.	1. Usually history of infection.
2. Often no history or signs of vulvitis, vaginitis, or endometritis.	2. Usually history and signs of vulvitis, vaginitis, cystitis, or endometritis.
3. Hereditary history of tuberculosis may be present.	3. Usually no hereditary history of tuberculosis.
4 Often history or signs of an old tuberculous disease.	4. Seldom history or signs of tuberculosis.
Fever; usually continuous and remittent.	Fever during acute but generally absent during chronic stage.
Pain; more or less continuous, but not severe.	Severe during acute stage.
Tenderness; moderate amount.	Severe during acute stage.
Abdominal; ascites common. Coils of intestines visible.	Ascites uncommon. Abdominal distention usually absent except during very early stage.
Physical signs; more nodular and more exudate, and boundary is usually not so well-defined as in non-tuberculous.	
Usually more emaciation than in non-tuberculous. May be diarrhœa. May occur before puberty.	Usually constipation. Seldom occurs before puberty.

It would seem from the above that a differential diagnosis could be easily made, but in many cases it cannot be done before abdominal section is made, and in a few of the cases not until a microscopic examination is made. The exact diagnosis is made by finding typical tubercles and tubercle bacilli. If the disease is tuberculous the bacilli can always be found, but it may at times be necessary to examine numerous sections and to use great care in staining the sections. The best method of staining is that of Kuhne and Bovel.

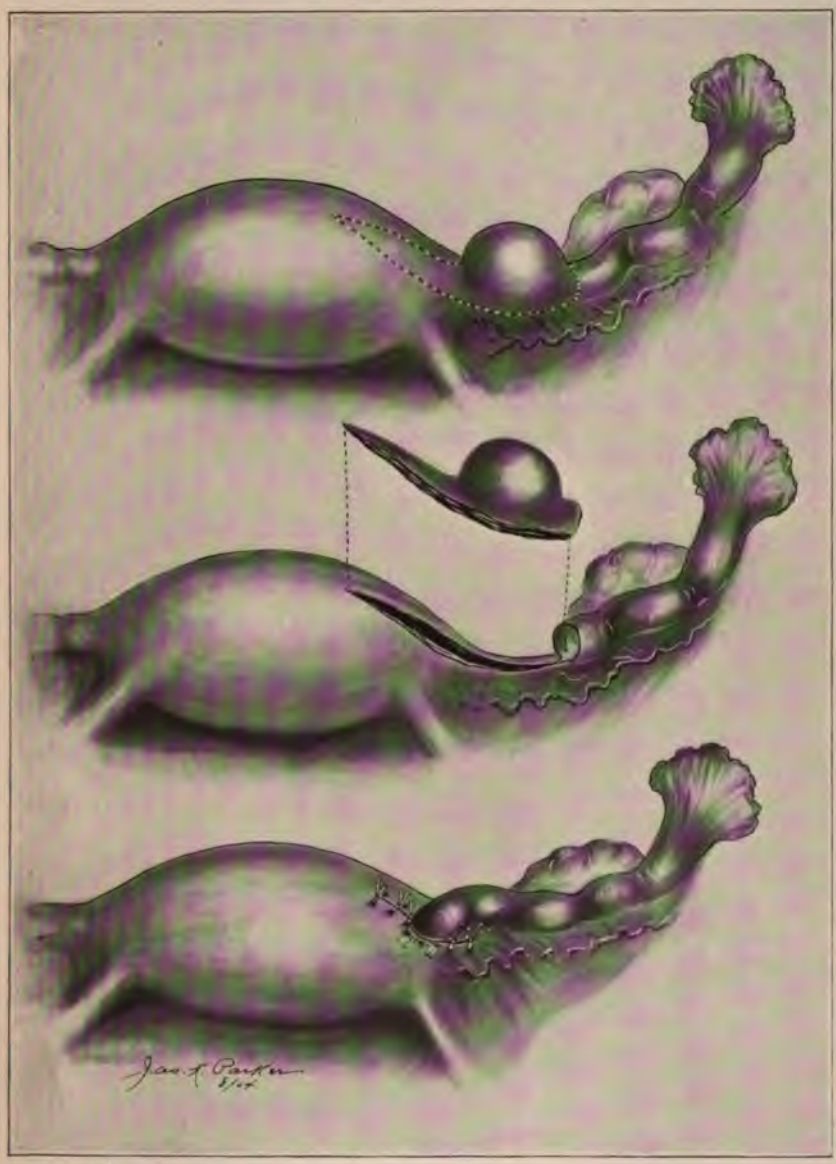
1. Stain the nuclei with hæmatoxylin.
2. Wash with water.
3. Ziehl-Neelsen carbol-fuchsin for twelve to twenty minutes.
4. Place in a 2 per cent. solution of aniline hydroch. for a few seconds.
5. Decolorize with alcohol and xylol.

Prognosis.—The prognosis of tuberculous salpingitis is always serious. It will vary with the extent of the disease and with the extent of the primary disease, with the general condition of the patient, and with the possibilities of care of the patient as regards diet, climate, etc.

There is no doubt that complete, spontaneous cures result, and numerous cases are reported of cure following abdominal section. After apparent cures, however, recurrence of the disease is always probable. This is especially true if it is a fact that the disease is always a secondary infection. It is impossible to give any exact percentage of recoveries with or without operation as so many factors are involved, and these all vary with different cases both in regard to pathological changes and environment.

Treatment.—The chief treatment, as in tuberculosis in any organ of the body, consists in general care of the patient.

PLATE LVII.



1. Salpingitis isthmica nodosa.
2. Excision of the diseased portion of the tube and the entire interstitial part of the tube.
3. The cut end of the tube is now inserted into the uterine wound.

The value of operative treatment is still an open question. Some authors contend that a cure is often obtained by abdominal section, while others claim that abdominal section has little or no value.

We believe that abdominal section is indicated in all cases except when the disease is far advanced, as there is always the possibility of a mistake in diagnosis, and we believe that recovery is usually more rapid with than without abdominal section.

Should Tuberculous Fallopian Tubes be Excised?—We believe that they should not be removed if the operation requires the separation of extensive firm intestinal adhesions, as the removal of the tubes then can be of little or no value, increases the mortality of the operation, and endangers the integrity of the intestinal wall. If the disease is limited to the tubes they should be excised.

If there is a general tuberculous peritonitis removal of the tubes can be of little value unless they are the site of extensive or primary tuberculous disease.

The conclusion is that tuberculous tubes should be excised if the disease is limited to the tubes, if the operation is not attended by extensive traumatism, and does not endanger the integrity of the intestines.

Drainage should usually not be employed, as it is of no value, increases the danger of infection, and is frequently followed by sinuses that are apt to persist and may become tuberculous.

The explanation of the apparent benefit from abdominal section has not been determined.

SALPINGITIS ISTHMICA NODOSA.

Under salpingitis isthmica nodosa quite a variety of different pathological conditions have been described. The classification given by Ries[1] we believe is the best and is the following:

"1. Non-inflammatory nodules:
- *a.* Adenomyomata.
- *b.* Intraparietal hydroparasalpinx.

"2. Inflammatory nodules:
- *a.* Salpingitis catarrhalis.
- *b.* Salpingitis pseudofollicularis, salpingitis isthmica nodosa.
- *c.* Salpingitis abscedens (salpingitis interstitialis, interstitialis disseminata).
  1. Specifica (tuberculosa, gonorrhœa).
  2. Non-specifica.
- *d.* Peritoneal growths (solid or cystic)."

We have, according to the title of our chapter, to deal with the inflammatory nodules only. We will not discuss the three subdivisions, *a*, *b*, *c*, separately, as we believe that these are only different stages or forms of the same disease. These inflammatory nodules are also found in tuberculosis of the Fallopian tubes and in gonorrhœal salpingitis, and are not characteristic of tuberculosis only, as Hegar suggests.

[1] Journal of Experimental Medicine, 1897.

Chiari[1] and Schauta[2] described in 1882 small nodules generally found in the isthmic portion of the tube and called them salpingitis isthmica nodosa. The nodules vary in size from one-eighth to one-half of an inch in diameter, are spherical in outline, hard in consistence, and have a well-defined border. They are single or multiple in number and may give the tube the appearance of a rosary. They may affect one or both tubes. Both authors found in all of their cases evidence of a chronic inflammatory disease (Fig. 295).

A typical case of salpingitis isthmica nodosa shows: an abnormal thick layer of muscular tissue, hyperplastic or hypertrophic, interposed between the circular and longitudinal layers of the tube, or only in the longitudinal muscular layer. In this tissue numerous epithelial forma-

FIG. 294

Pyosalpinx, showing adhesions and salpingitis isthmica nodosa; the ovary is in the concavity of the tube.

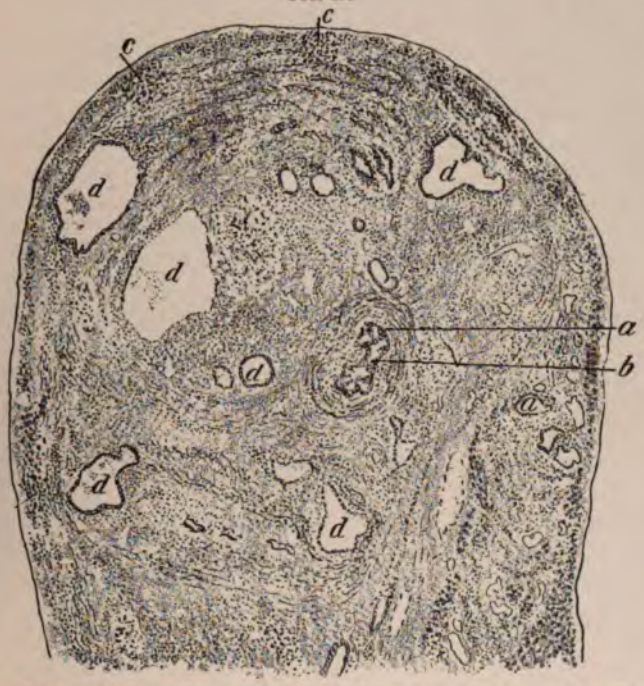
tions, some of which show a round cyst-like appearance, are found, while in other cases the cysts may be elongated like glands or ducts and may be tortuous, even ramifying in character. Some of them look like contorted tubuli dilated in places and others look like glomeruli—pseudo-glomeruli. Some of them are surrounded by connective tissue, like a tunica propria, and the connective tissue is filled with round cells. Many of them are surrounded by a muscle layer. The size and contents of the cysts vary. The contents may be serous fluid or pus and contain more or less destroyed epithelial cells, pus cells, pigment granules, or psammoma. The epithelium of these cysts is chiefly columnar, but pavement and even cylindrical epithelium with cilia have also been found. On serial sections communication between these cysts and the

[1] Zeitschr. f. Heilkunde, 1887.

[2] Archiv f. Gynäkol., 1888.

lumen of the tube by epithelial canals can nearly always be determined. This communication and the similarity of the epithelium in the tube and the epithelial formations show that these cysts originate from the mucosa of the tube. We also find in some cases of endometritis that the glands penetrate the muscular layer. The same thing occurs here and is produced by inflammatory processes. The inflammatory process may be gonorrhœal or a mild form of tuberculosis and is not characteristic of any special infection. In some cases of salpingitis nodosa epithelial formations predominate, while in others hyperplasia of the

FIG. 295



a, lumen of the tube; *b*, part of the tubal wall; *c*, round-cell infiltration; *d*, pseudocysts.

connective tissue or hypertrophy of the muscle is the most pronounced. In some cases all of these changes are found, depending upon the character of the inflammatory process.

Ries,[1] after giving a very complete pathological description of numerous specimens, and after a critical review of the literature, gives the following conclusions:

"1. Nodular enlargement of the tube can be caused by a number of different pathological conditions.

"2. Clinical examination does not enable us to make a diagnosis of the pathological condition existing in an individual case of nodule of the tube.

[1] Loc. cit.

"3. The diagnosis of the nature of a tubal nodule can be made only with the microscope.

"4. The conditions causing nodular enlargement of the tube are congenital or acquired, non-inflammatory or inflammatory.

"5. Any one of these conditions can exist without the production of nodules.

"6. The nodules can be found in all parts of the tube and, taking the peculiar anatomy of each part of the tube into account, show the same structure.

"7. The enlargement can be caused by epithelial or epithelioid formations, connective or muscular tissue, by round-cell infiltrations, or combinations of two or more of these.

"8. The epithelial formations originate in the epithelium of:

"*a*. The tubal mucous membrane (salpingitis pseudofollicularis, adenomyoma originating in the tubal epithelium).

"*b*. The accessory tubes (intraparietal parasalpinx and hydroparasalpinx).

"*c*. Remnants of the Wolffian body (adenomyoma).

"9. The epithelioid formations originate in the peritoneal endothelium (peritoneal growths under 'relative heterotopy').

"10. The excess of formation of connective tissue is a consequence of inflammatory conditions of the tubal wall (salpingitis interstitialis, Zweifel).

"11. The hypertrophy of the muscular tissue is:

"*a*. Non-inflammatory (adenomyoma).

"*b*. Consequent upon inflammation, Kaltenbach's case (23).

"12. The accumulations of round cells are direct evidence of inflammation.

"*a*. Non-specific (salpingitis interstitialis disseminata, salpingitis abscedens); or

"*b*. Specific (salpingitis tuberculosa or salpingitis gonorrhoica).

"13. The epithelioid formations can occur wherever pseudomembranes cover organs lined with a serous coat.

"14. Extrauterine pregnancy (abdominal or tubal) produces epithelioid formations by causing pseudomembranes to form, not by any irritation peculiar to the pregnancy."

Symptoms.—The symptoms of salpingitis isthmica nodosa vary as in other forms of salpingitis with the extent of the pathological changes, etc. These nodules diminish but do not occlude the lumen of the tube. They may be etiological factors in the cause of sterility and ectopic pregnancy from the mechanical disturbance which they cause in the tubal canal.

Treatment.—Their treatment consists in excision, and whether all or a portion of the tube is removed with them depends upon the condition of the other portions of the tube. (See Indication for Plastic Operations upon the Tubes.)

CHAPTER XXV.

INFECTIONS OF THE OVARIES.

By THOMAS J. WATKINS, M.D.

Frequency.—Martin found in 36,158 gynecological patients 4948 cases of disease of the ovaries. In 4707 of these cases the disease was the result of an infection. In 179 of the cases the inflammatory disease was complicated by neoplasms.

Martin also observed in 9055 private patients 888 cases of infection of the ovaries.

This indicates that the ovary is diseased in about 10 per cent. of all gynecological cases, and that the proportion of infections and neoplasms is about 6 to 1. In these statistics no mention is made of acute ovaritis.

Olshausen found 13 cases of acute ovaritis in 27 necropsies upon women who had died from puerperal sepsis.

The annual report of the Charity Hospital in Berlin shows only 10 cases of acute ovaritis in 70 postmortem examinations of cases of puerperal sepsis.

Martin found 110 cases of ovarian abscess among 5504 gynecological cases. All of the 110 were chronic cases.

Etiology.—All cases of ovaritis are probably due to an infection. Dolores and Bouges[1] report that they always found staphylococci in the cysts of all cases of chronic ovaritis, and that the bacteria were found virulent in some of the cases. This is the only report that gives positive results in the bacteriological examination of all cases of chronic ovaritis. From what is now known relative to bacteriological examinations of chronic cases of pelvic infection one must question the accuracy of their methods of examination.

Much has been determined as regards the bacteriology of acute ovaritis and ovarian abscess. Gonococci, streptococci, staphylococci, pneumococci, typhoid bacilli, tubercle bacilli, colon bacilli, influenza, dysenteria, cholera, malaria, actinomycosis fungus, and anäerobic saprophytes have been found. The colon bacilli are frequently found in cases of abscess of the ovary (Menge). The bacteriology of ovaritis is very much like that of salpingitis.

Primary infection of the ovary, as of the Fallopian tube, very seldom occurs. Ovaritis is most frequently the result of an extension of an infection from another organ.

Of 4998 cases of ovaritis 2665 of them had leucorrhœa; 823 of them

[1] Arch. de obstet. et gyn., 1895, p. 909.

had metritis; 194 of them had metritis colli; 1381 of them had diseased tubes; 1590 of them had perimetritis; 915 of them had perioöphoritis; 389 of them had retroflexion of the uterus.

Menge found in 37 cases of abscess of the ovary bacteria in 19 of them, and the variety of bacteria was as follows: gonococci, 9 cases; tubercle bacilli, 4 cases; colon bacilli, 4 cases; streptococci, 1 case; anäerobic bacteria, 1 case.

The 37 cases of abscess of the ovary were divided as follows: abscess of the ovary, 8; follicular or pseudoabscess, 12; tubofollicular abscess, 7; tubo-ovarian abscess, 2; suppurative tubo-ovarian cysts, 4; suppurative ovarian cysts, 4.

Martin found in 110 cases of ovarian abscess the following: bilateral, 23; of the left ovary, 47; of the right ovary, 40.

Salpingitis (purulent, 84; catarrhal, 9) was present in 93 of the cases. The tubes were normal in 17 of the cases.

In 15 of the cases there was a bilateral purulent salpingitis and a unilateral ovarian abscess.

In 1 case an ovarian abscess was present on one side and a salpingitis on the other side.

Routes of Infection.—The ovary may become infected:

1. By contact of the surface of the ovary with infectious material. The infectious material may result from a salpingitis, an appendicitis, etc.

The ovary may become infected by extension, by contiguity from a salpingitis along the fimbria ovariaca or along adhesions.

A pyosalpinx may become adherent to an ovary and rupture into a follicle or into the stroma of the ovary. The presence of a recent corpus luteum not only diminishes the resistance to the infection, but is also an excellent nidus for the growth of bacteria.

2. Through the hilus of the ovary; (*a*) by the lymphatics; (*b*) by the bloodvessels.

In puerperal cases the ovary is more often infected through the lymph and bloodvessels than by contact infection on the surface of the ovary. The infection may thus travel from the vagina, cervix uteri, or corpus uteri. The Fallopian tube may or may not be involved in the infection. Metastatic infection of the ovaries through bloodvessels has been observed.

Pathology.—The pathology will be divided into:

1. Puerperal ovaritis.
2. Non-puerperal ovaritis.
3. Ovarian abscess.

Puerperal Ovaritis.—The pathological changes will vary with the route of infection, and will depend somewhat upon whether the infection occurred upon the surface of the ovary, or through the lymph and bloodvessels, and will consequently be divided into:

1. Changes in the albuginea and germinal epithelium.
2. Changes in the stroma and parenchyma.

1. *Changes in the Albuginea.*—With contact infection upon the surface of the ovary the pathological changes are first observed in the

germinal epithelium, and the changes will depend upon the duration and severity of the infection. The ovary will be more or less covered with thin, friable, fibrinous precipitates, or it may be covered with pus, with jelly-like thick purulent membranes, depending upon the character of the surrounding pelveoperitonitis. In very acute cases the greater part of the germinal epithelium is soon destroyed and shows often fatty degeneration. In less acute cases portions of the epithelium remain intact. Round-cell infiltration occurs between the fibres of the albuginea, but to a limited extent, on account of the dense structure. The dense structure of the albuginea may allow the infection to extend to the stroma of the ovary, but it frequently limits the infectious process to the surface of the ovary.

When the infection travels through the albuginea to the deeper layers the changes that take place within the ovary are much the same as when the infection occurs through the lymph vessels.

2. *Changes in the Parenchymatous Tissue.*—Puerperal infections of the ovary usually occur through the lymph vessels, and the pathological changes can often be traced in these cases along the lymphatics.

The ovary early becomes hyperæmic, the vessels in the hilus are especially engorged, and the ovary becomes enlarged as the result of congestion and œdema. Small hemorrhages frequently occur in the ovary. In more-advanced or more severe infections incisions into the ovary often show the liquor folliculi cloudy or purulent, and may reveal small abscesses in the stroma of the ovary. In still more advanced cases the ovary may contain numerous abscesses or one large abscess, and the suppuration may be so extensive as to leave only enough tissue to form a thin wall for the abscess. The infection may or may not extend from the parenchymatous tissue through the albuginea, and consequently perioöphoritic changes may or may not be present.

Microscopic sections in the early cases show hyperæmia, round-cell infiltration, which may be circumscribed, diffuse, or may extend along the vessels. In some cases the process can be traced microscopically from the parenchyma to the albuginea, or *vice versa*.

In more advanced cases abscesses of various size will be found in the follicles or in the stroma. These abscesses are at times the former site of hemorrhages or thrombi in the ovary. Round-cell infiltration and œdema are found about the follicles, and dilated bloodvessels frequently protrude into the larger follicles and rupture. These changes and the consequent trophic disturbances cause the epithelium of the follicles to degenerate, round cells accumulate, the liquor folliculi thus becomes cloudy, and finally suppuration occurs and a pseudoabscess results. A pseudoabscess may rupture into the stroma, or an abscess in the stroma may rupture into a follicle or the partitions between abscesses may break down, and thus multiple abscess may become a single abscess.

Corpora lutea, especially when open, offer very little resistance to infection, are excellent culture media for the growth of bacteria, and consequently frequently suppurate and form luteal abscesses. Sup-

puration occasionally occurs in thrombi, and thrombi are frequently found in very acute inflammatory processes.

In cases of oöphoritic abscesses perioöphoritic abscesses, and cysts are at times found, and it may be impossible to determine which is the primary and which is the secondary lesion. It is possible for a coincident infection to occur through the vessels and on the surface of the ovary, and then the oöphoritic and perioöphoritic abscesses might both be primary.

Acute ovaritis with or without suppuration may destroy some or all of the follicles, and yet one may find apparently normal Graafian follicles containing normal ova in the presence of very extensive inflammatory changes and suppuration in the ovary.

The fact that menstruation is seldom interrupted by double ovaritis or bilateral ovarian abscess demonstrates that all of the Graafian follicles are very seldom destroyed.

The changes that take place between the ovary and tube in cases of salpingitis and ovaritis are described under Salpingitis.

Puerperal ovaritis and periovaritis may terminate:

1. In complete resolution.

This may occur even in the presence of extensive inflammatory changes. In some mild cases, however, the contrary may be true. This may be spontaneous or may follow drainage of an abscess. It is less liable to occur in gonorrhœal than in other infections.

2. With adhesions fixing it to other organs or in Douglas' cul-de-sac. In these cases the ovary is often larger than normal, and prolapsed as the result of gravity and adhesions. The adhesions may disappear after existing for weeks or months.

3. In chronic abscess (infrequent in non-gonorrhœal puerperal cases).

4. In chronic ovaritis.

5. In atrophy. This may result from a cicatrization of the hyperplastic connective tissue and cellular infiltration. The termination will depend much upon the variety, virulence, and duration of the infection, the character of the pathological changes in and about the ovary, the treatment pursued, and the general health of the patient.

The pathological changes of chronic puerperal ovaritis are similar to those of non-puerperal infections—like the gonorrhœic—and will be discussed with them.

The pathological changes that result from colon bacilli infection differ somewhat from other infections. This infection is very liable to occur when adhesions exist between the ovary and an intestine, or between the ovary and the appendix. It occurs in some of the very severe cases of mixed puerperal infection. Colon bacilli infect oftener than other bacteria a ruptured Graafian follicle or a cystic follicle. The abscesses often contain gases and have very offensive odors (fecal odor).

Anäerobic bacteria are an infrequent cause of ovaritis, but may be present in some of the very severe puerperal infections. They occasionally produce complete putrescence of the ovary. Not much is known of the role that the anäerobic bacteria take in infections, but careful

investigation will probably demonstrate that they are frequently present and often cause infections.

NON-PUERPERAL OVARITIS.—Gonococci are the most common and important cause of non-puerperal ovaritis. Gonococci in the non-puerperal condition usually travel along mucous membranes, and consequently they usually infect the ovary secondary to the Fallopian tube. In puerperal cases, however, they may infect the ovary through the lymph vessels.

In non-puerperal cases, therefore, the pathological changes will be chiefly those of perioöphoritis with its sequences. The changes in the albuginea and germinal epithelium will usually be very little at first, but repeated acute exacerbations will finally cause the ovary to become more or less covered with thick membranes, which will fix it to the tube, to other adjacent organs, or cause it to prolapse and become adherent in Douglas' cul-de-sac. The ovary and tube will often appear as one mass. The germinal epithelium will often remain intact underneath these membranes, a pathological fact which is peculiar to gonorrhœal infection.

The albuginea will often protect the deeper structures of the ovary from infection unless the infectious material comes in contact with a corpus luteum or a very thin-walled follicle, and it is probably true that nearly all cases of gonorrhœal ovarian abscesses result from infection in this manner.

When the gonococci penetrate the stroma or parenchyma of the ovary they produce changes similar to those caused by infection through the vessels, which are described under puerperal infection. Gonococci may not only be found in the perioöphoritic and oöphoritic abscesses but also in the adhesions, stroma, and parenchyma of the ovary. Abscesses may be found in the stroma, and the site of follicles and corpora lutea. Corpus luteal abscesses are the most common. The termination may vary as in puerperal cases.

If the abscess becomes chronic the fluid portion of the pus may absorb and a calcareous mass may form.

With chronic abscesses acute exacerbations usually occur as described under pyosalpinx. The abscess may rupture into another organ or through the skin, and there the conditions will be much the same as the rupture of a pyosalpinx. Complete resolution may follow rupture, incision, and drainage, but these cases are usually bad ones for drainage.

The disease may terminate in a chronic ovaritis. The conditions will then depend much upon whether the connective tissue or the parenchymatous tissue is the more affected, upon the character of the perioöphoritic changes, and particularly upon the changes in the tube. The albuginea in chronic ovaritis is often much thickened and white, like porcelain. The adhesions are usually very extensive, firm, and sometimes the site of extensive cell infiltration. These adhesions may diminish and gradually disappear, but they usually become worse and worse as the result of repeated acute exacerbations.

Microscopic examination shows the albuginea the seat of extensive hyperplastic connective tissue with very few nuclei. The fibres are often very long. Round-cell infiltration and more often hyaline degeneration occurs. The germinal epithelium may be destroyed in places or may become more or less flat.

When the interstitial tissue is involved the ovary will at first be swollen two or three times larger than normal, but later cicatricial contraction takes place, and this frequently causes indentations in the organ. This cicatrization may continue until it causes the ovary to become smaller than normal and produce atrophic changes in the parenchymatous tissue.

Microscopic examination will show an increase of connective tissue and frequently a decided diminution of the cellular elements, and particularly the follicles. Many of the follicles are found cystic. Corpora albicantia are sometimes numerous as the result of an endarteritis, which later undergoes hyaline degeneration.

In cases of universal chronic ovaritis, periovaritis may be absent. The ovary is much enlarged; the surface may be normal, smooth, or uneven from the presence of enlarged follicles.

On microscopic examination the connective tissue, sometimes hyperplastic, is compressed by round-cell infiltration; some of the follicles are enlarged, cystic, and the liquor folliculi in some of them cloudy. The number of the follicles is decreased.

The presence of perioöphoritic membranes, cell infiltration, and adhesions may prevent rupture of mature Graafian follicles, and thus they become cystic. Cystic follicles are further discussed under ovarian neoplasms.

Ovarian Abscesses.—Abscess of the ovary may be divided into acute and chronic. They may also be divided into:

1. Abscesses in the stroma.
2. Abscesses in the follicles (pseudoabscesses).
3. Abscesses in the corpus luteum (corpus luteal abscesses).
4. Tubofollicular or tubo-ovarian abscesses.

Puerperal ovarian abscesses are usually unilateral and gonorrhœal ovarian abscesses are frequently bilateral and generally associated with a salpingitis. The abscesses may be single or multiple and may vary in size from microscopic dimensions to eight or ten inches in diameter. Ovarian abscesses are capable of becoming much larger than tubal abscesses. Follicular abscesses are at first lined by epithelium, which is later displaced by granulation tissue. At first the wall of the follicle (theca folliculi) forms the wall of the follicular abscess, but later this relation is lost (Figs. 296 and 297).

Interstitial abscesses have no well-defined border, are often near the surface or hilus of the ovary, increase in size by extension and rupture of one into another, and are frequently found along lymph vessels.

Corpus luteal abscesses have a characteristic macroscopic and microscopic appearance.

Macroscopic.—The inner wall of the abscess is wavy and yellow pigmented like the inner wall of a corpus luteum. The boundary between the abscess and surrounding tissue is well defined.

Microscopic.—1. They contain an inner layer of granulation tissue with papillary excrescences.

2. The layer of luteal cells, which are large, resemble decidual cells and are stained by a yellowish pigment. Between these cells are found leukocytes, chiefly polynuclear.

FIG. 296

Section of ovary containing multiple abscesses.

3. Their external wall is made up of connective tissue (frequently undergoing hyaline degeneration) and round-cell infiltration. The relative frequency of luteal abscesses is illustrated by finding in 30 cases of ovarian abscess 21 corpus luteal and 9 interstitial and follicular abscesses.

Actinomycosis of the Ovary.—This disease in the cases reported was secondary to an infection in the vagina or intestine. Abscesses of various sizes occur in the ovary and contain the characteristic actinomycosis pus and fungi. Very extensive adhesions result and obscure

the primary focus of the infection. In Habel's,[1] Stewart's, Granger's, and Muris'[2] cases the infection occurred through the vagina, uterus, and tubes. In Bortrow's[3] and Zeman's[4] cases the infection occurred through the intestines. This was proven by the presence of numerous intestinal fistulæ and adhesions.

In cases of exanthemata which terminated fatally parenchymatous degeneration of the ovary has been observed.

FIG. 297

Section of ovary containing multiple abscesses, which shows a normal Graafian follicle with a well-developed ovum.

Metastatic abscesses in the ovary in cases of pneumonia have been reported.

Tuberculosis of the Ovary.—Primary tuberculosis of the ovary seldom occurs and the cases that have been reported are not well established. What has been said relative to the diagnosis of primary tuberculosis

[1] Virchow's Arch., Bd. clxvi., S. 1.
[2] Ziegler's Beitrige f. Path. Anat., 1891, Bd. ix.
[3] Edinburgh Hospital Reports, 1895, vol. i.
[4] Wiener Med. Presse, 1883, p. 486.

of the tube and relative to the possibilities of primary infection by means of the spermatozoa applies to primary infections of the ovaries.

Williams reports cases of secondary tuberculosis of the ovary where the ovary was the first organ that was secondarily involved. In most cases of tuberculosis of the ovary the disease is secondary to tuberculous salpingitis or peritonitis. Of 50 cases of tuberculosis of the ovary 28 had tuberculous salpingitis and 22 had tuberculous peritonitis.

The relative frequency is illustrated by the report of 35 cases of tuberculous ovaritis out of 105 cases of tuberculosis of the female genital organs.

Routes of Infection.—1. By contiguity of tissue from tube or peritoneum.

2. By lymph and bloodvessels. It is possible but not probable for tubercle bacilli to reach the ovary through a wound in the vagina and produce an ovaritis without causing a vaginitis.

One should remember that a diagnosis of tuberculosis of the ovary can at times be made only upon microscopic examination.

1. Perioöphoritis tuberculosa.

2. Real tuberculosis of the ovary. This form is often a sequence to the first one.

Perioöphoritis is divided in: (*a*) disseminata, (*b*) diffusa.

In cases of perioöphoritis disseminata we find typical miliary tubercles spread out over the whole surface of the ovary. This form accompanies the miliary form of tuberculous peritonitis and seldom shows caseous degeneration.

In the diffuse form of tuberculous perioöphoritis we find the ovary surrounded by and enclosed in thick tuberculous membranes with characteristic tubercles and caseous changes.

The tuberculosis propria ovarii is divided into: (*a*) miliary, (*b*) caseous, (*c*) abscess form.

(Schottländer, Jena, 1896, Eierstock's *Tuberculose.*)

The relative frequency of the different varieties is suggested by the following: Among 50 cases of real tuberculosis of the ovary was found 22 of the miliary, 13 of the caseous, and 15 of the abscess form.

These three forms are not distinct varieties of the disease, but often denote different stages of the same disease, as miliary may become caseous and the caseous may suppurate.

Caseous masses may vary from one microscopic in size to one about one inch in diameter. Tuberculous abscesses vary in size and number, as do other abscesses of the ovary.

Tuberculous tubo-ovarian abscesses described by Williams, Menge, and Kretz are occasionally found, but comparatively not nearly so often as gonorrhœal tubo-ovarian abscesses.

The miliary form of tuberculous ovaritis (Wolf, Schottländer, and Williams) may affect the appearance of the organ so little as to be detected only on microscopic examination. The disease is usually bilateral, ascites is usually absent but perioöphoritic cysts as described under tuberculosis of the tube are sometimes found.

On microscopic section typical tubercles, round-cell infiltration, entirely isolated giant cells, and epithelioid cells are found. The germinal epithelium may be intact except at the site of tubercles. Often the extension of a perioöphoritis to an oöphoritis can be traced. Miliary tubercles are more often found in the cortical than medullary layer of the ovary. Microscopic examination will usually reveal more advanced changes in the outer than in the inner layers of the ovary, and will thus point out the probable route of infection. Solid masses of epithelium extending from the germinal epithelium into the deeper structures of the ovary are occasionally seen. The superficial or large follicles are frequently involved but the deep or small follicles usually escape injury. The corpus luteum is quite often the site of the disease.

Caseous Variety.—Small or large centres of caseation may be found in the ovary. The caseous areas are sharply defined from the surrounding ovarian tissue. Calcareous concretions and scar tissue around it are at times found in the caseous substance. Pathological conditions are occasionally found which indicate that the miliary is changing to the caseous form by confluence.

Tuberculous Abscess.—Contents. The contents of these abscesses consist principally of crumbling pus. The wall of the abscess consists of granulation and connective tissue, with many polynuclear leukocytes, miliary tubercles, and giant cells.

The abscesses may also here be divided into real abscesses, follicular, and corpus luteal abscesses (pseudoabscesses).

In all of the various varieties of tuberculosis of the ovary it is not always easy to prove that the disease is tuberculous. In 50 cases where an examination was made tubercle bacilli were found in only 19 of them. A positive result may be obtained by injecting some of the secretion into animals.

Symptomatology of Infections of the Ovary.—The symptoms will be divided into acute and chronic. One should remember that infection of the ovary alone seldom occurs; that other pelvic organs (especially the Fallopian tubes and peritoneum) are usually infected, and that consequently cases of ovaritis, as a rule, also have symptoms from infection of other adjacent organs.

Acute Ovaritis.—The symptoms in cases of acute puerperal or acute gonorrhœal ovaritis are principally the symptoms of an acute pelvic or general peritonitis. If suppuration occurs in the ovary an increase in the pain, fever, meteorism, and pulse rate generally takes place. On examination a sensitive swelling may be palpated, posterior or to one or both sides of the uterus.

What was said relative to pain in salpingitis applies to pain in ovaritis, as the pain in the two conditions is much the same, and in fact most cases of ovaritis have salpingitis.

Pain in the breasts is given as a symptom of ovaritis. This does not, I believe, occur in salpingitis and we have never observed it in ovaritis.

The symptoms from coincident infection of other organs is much the same as given under salpingitis. Menstruation may be suppressed,

diminished, or increased in amount in acute ovaritis. The menstrual symptoms are probably more dependent upon a coincident endometritis than upon the ovaritis.

In mild cases recovery is usually rapid and may be complete. In severe cases extensive pathological changes usually take place, but even in these cases spontaneous recovery may result. Recurrent attacks may take place but are not as common as in salpingitis.

Premature menopause may occur from destruction of all of the Graafian follicles in both ovaries. This occurs at times from acute puerperal infection as it does in some severe cases of typhoid fever, gonorrhœa, pneumonia and the like.

In gonorrhœal cases the tendency is for the disease to become chronic and for the cases to suffer from acute exacerbations, as in salpingitis. In puerperal cases the general symptoms of the infection often cause more symptoms than occur from the ovaritis.

Perforations of ovarian abscesses are the same as perforations in pyosalpinx.

After all is said with reference to the symptomatology of acute ovaritis one must remember that the symptoms usually do not even suggest whether the infection is in the Fallopian tubes or ovaries, and also that an infection in one of these organs nearly always means an involvement of the other organ.

CHRONIC OVARITIS.—In all cases of acute ovaritis the disease may become chronic. The symptoms will depend principally upon the pathological changes that have resulted.

The most common symptoms result from adhesions and the adhesions most often produce symptoms from displacement of the ovaries. Adhesions of the intestines may cause constipation, intestinal flatulence, and symptoms of intestinal indigestion. The adhesions may cause a displacement in Douglas' cul-de-sac and this displacement often causes a dragging pain in the region of one or both inguinal regions, frequently produces backache, and dyspareunia is a common symptom. The pain is generally worse during menstruation and the increased amount of pain often precedes and follows menstruation for a variable time. Some of these patients experience relief from pain for only one or two weeks each month.

Prolapsus of the ovary with its accompanying symptoms may result from increase in the weight of the ovary as a sequence of ovaritis. Ovaritis often causes an increase in the amount of connective tissue, and this increase of connective tissue is in all probability an important etiological factor in the production of follicular cysts of the ovary. So-called "sclerotic" and "sclerocystic ovaries" are, however, often found in cases where there has never been an infection and are occasionally found where there have been no symptoms of pelvic disease. There is no authentic symptomatology for "sclerotic" and "sclerocystic ovaries." In all small cysts in the ovary a careful microscopic examination will generally reveal normal ova.

The conclusion, therefore, is that all so-called "sclerotic" and

"sclerocystic ovaries" should be considered non-pathological until at least investigation shall prove otherwise.

In suppurative ovaritis the pus often becomes sterile and the disease chronic. If the liquid part of the pus is absorbed the solid portion may become calcareous and then the symptoms will be those of an enlarged prolapsed ovary.

A large chronic ovarian abscess at times resembles in subjective and objective symptoms a uterine fibromyoma with salpingitis.

Acute exacerbations in chronic suppurative ovaritis frequently occur but not so commonly as in suppurative salpingitis, because infection more often remains "latent" in mucous membranes than in other tissues and because of the close relation of the mucosa of the tube to the endometrium which is usually infected in these cases.

The majority of cases of chronic ovaritis are also cases of chronic salpingitis and have the symptomatology given under chronic salpingitis.

Diagnosis of Infection of the Ovaries.—The diagnosis of infection of the ovaries is extremely difficult as the disease is often secondary to and associated with a salpingitis. In fact nearly all cases of non-puerperal infection of the ovaries are secondary to a salpingitis. Consequently the diagnosis of non-puerperal ovaritis is the diagnosis of salpingitis, as nearly all cases of salpingitis have more or less ovaritis. In puerperal cases the ovary is more often infected than the tube, as the disease then more frequently extends by the blood and lymph vessels than by continuity of tissue. In gonorrhœal infections during the puerperium, however, the tubes are generally involved.

The size and contour of the swelling may be of some service in distinguishing between ovaritis and salpingitis, as an ovarian abscess is frequently larger than a pyosalpinx and is generally oval, while a pyosalpinx is usually cylindrical.

The palpation of nodules along the tube (salpingitis isthmica nodosa) may assist in distinguishing between an ovaritis and salpingitis. The variety of the infection may be of service in distinguishing between ovaritis and salpingitis, as in gonorrhœal cases the tube is much more frequently the chief location of the infection than the ovary. Extensive involvement of the ovary can infrequently be excluded by palpation of the ovary separate or at the side of the inflammatory tubal mass.

In some cases of chronic ovaritis the outline of the ovary is easily detected on conjoined palpation, and the absence of an inflammatory thickening in the region of the tube will permit one to exclude a salpingitis.

"The palpation of normal tubes" is extremely uncertain in practice. The differential diagnosis between ovaritis and salpingitis is fortunately of little practical value, as the two diseases are so frequently found together and the indications for treatment is very much the same.

The occurrence of a premature menopause following a severe pelvic infection should suggest an ovaritis with destruction of all Graafian follicles. The presence of menorrhagia may suggest an ovaritis, as the impulse to menstruation originates in the ovaries.

The differential diagnosis between salpingitis and other pelvic diseases, as given under salpingitis, applies in almost its entirety in the differential diagnosis between ovaritis and other pelvic diseases.

Chronic ovaritis may be mistaken for normal conditions which increase the size of the ovary, such as follicular cysts, mature Graafian follicles, or hæmatoma in a ruptured Graafian follicle. The history of the case as regards infection and symptoms and examinations at intervals should always enable one to make a differential diagnosis.

Large ovarian abscesses may be mistaken for almost any pelvic neoplasm. It is at times impossible to distinguish between an ovarian abscess and a uterine myofibroma, complicated by salpingitis, without an abdominal section.

Plate LII. shows a tubo-ovarian abscess which could not be differentiated, partly on account of its close relation to the uterus, until the abdomen was opened. In one case of ovarian abscess operated on by me a uterine fibromyoma with extensive adhesions could not be excluded until considerable investigation was made, even with the abdomen opened, as the uterus resembled a fibroid nodule in the side of a myomatous uterus.

It should be remembered that a thick, tense ovarian abscess wall may resemble in appearance a myomatous uterus.

A chronic ovarian abscess may be mistaken for an ovarian cyst with adhesions or complicated by a salpingitis. In fact it may be impossible to differentiate them without an abdominal section.

In puerperal infections a pelvic cellulitis may be mistaken for an ovarian abscess. An ovarian abscess has a more globular contour, has a more definite outline, and usually extends higher in the abdomen than a pelvic cellulitis, as the latter extends along the pelvic wall and remains chiefly extraperitoneal. (See Diagnosis of Salpingitis.)

Prognosis of Infection of the Ovaries.—The prognosis of an acute puerperal ovaritis is always serious, as any puerperal infection which extends beyond the uterus is always attended by danger. The mortality depends chiefly upon the virulence of the infection, and it must be remembered that the ovaritis in these cases is only a small part of the disease. The dangers of life are greater in recent cases than in cases that have lasted a few days, other things being equal, as the virulence of the infection tends to become less and less and the formation of inflammatory exudates tends to diminish the amount of absorption.

Blood examinations are valuable in determining the prognosis. A daily diminution of leukocytes is a valuable and favorable prognostic sign. An increase in leukocytes suggests suppuration, but puerperal cases can have considerable leukocytosis (15,000 or 20,000) without the formation of pus. The seriousness of the prognosis is largely proportionate to the amount of peritonitis. Involvement of the intestines as shown by constipation and distension are unfavorable symptoms. The prognosis will also depend upon the general symptoms of the puerperal infection which are enumerated elsewhere.

The prognosis of radical operations during the acute stage of the disease is bad on account of the dangers from septicæmia and because these patients have a relatively small amount of resistance.

In acute cases the prognosis is better without than with operation unless large abscesses form. With large abscesses the prognosis is better with incision and drainage than with radical operations. It should be remembered that large puerperal exudates in and about the ovary frequently disappear entirely without surgical interference. With incision and drainage of well-defined abscesses the probabilities are very good for a complete recovery.

In most non-puerperal cases (which are usually secondary to a salpingitis) enough ovarian tissue usually is left to preserve ovulation and menstruation. In gonorrhœal cases one can be almost certain that all of the ovarian tissue is not destroyed.

In chronic ovarian abscesses the prognosis is about the same as for ovarian cysts.

The prognosis of ovaritis as regards mortality with and without operations is practically the same as in salpingitis. The prognosis as regards the preservation of functions is better in ovaritis than in salpingitis. (See Prognosis of Salpingitis.)

Treatment of Infection of the Ovaries.—The treatment of acute puerperal ovaritis is much the same as the treatment of acute puerperal salpingitis. Palliative treatment should be employed in preference to operative treatment if the patient's condition indicates improvement and should be continued as long as the improvement lasts. It should be remembered that complete spontaneous recoveries frequently occur. The palliative treatment consists chiefly in the use of the ice-bag, saline cathartics, and forced nourishment. If the patient's condition is especially dangerous or continues to get worse an exploratory incision through the posterior vaginal fornix is indicated, especially if there is suspicion of pelvic peritonitis.

Incision and drainage is usually preferable to any radical operation in acute cases. Incision and drainage is especially indicated when there is a well-defined abscess in close proximity to the vagina. Care should be taken to open all abscesses, as multiple abscesses are frequently present. Incision and drainage give better results in ovarian than in tubal abscesses because of the mucous membrane of the tube.

In chronic ovaritis the Fallopian tubes are usually diseased and the indications for treatment lie chiefly in the tubal affection. Conservative treatment in these cases can be applied to the ovary to much better advantage than to the tube, as the dangers of latent or residual infection in the ovary are much less than in the tube and the functions of the tubes are much more easily destroyed than of the ovaries. Enough ovarian tissue can usually be saved to preserve ovulation and menstruation.

Adhesions of the ovaries can be separated and portions of the ovaries can be excised without destroying their functions. When it is necessary to excise a portion of an ovary the wound should be carefully closed by suture. If the ovaries are prolapsed care should be taken to correct

the displacement by shortening of the utero-ovarian ligament by suture or by suture of the ligament to the posterior surface of the broad ligament.

Cases of prolapse of an enlarged ovary as the result of an ovaritis should not be mistaken for the temporary enlargements due to physiological causes.

Palliative treatment, such as the use of tampons, etc., is of little or no value and these cases are usually cured only by operative procedures. It is often a question whether the amount of disturbance produced is sufficient to indicate surgical treatment.

The surgical treatment consists in correcting the displacement by shortening the utero-ovarian ligament or by suture of the ligament to the broad ligament. A portion of the ovary may be excised if there are sufficient pathological changes to indicate such a procedure. Such treatment is not indicated in women near the menopause, as the atrophic changes that take place at that time will usually cure the disease.

The operation can be done through an abdominal incision or through an incision in the anterior vaginal fornix.

Large chronic ovarian abscesses require excision of the ovary. Some ovarian tissue in these cases may even at times be saved in young women if necessary to preserve ovulation and menstruation.

If an ovary is excised its tube should be removed if there is evidence of any salpingitis or if there is a septic endometritis. Otherwise there is no indication for a salpingectomy. (See Treatment of Salpingitis.)

CHAPTER XXVI.

EXTRAUTERINE PREGNANCY.

By X. O. WERDER, M.D.

By extrauterine pregnancy or ectopic gestation we understand a gestation in which the fertilized ovum has been prevented from reaching the uterine cavity and becomes implanted and develops in the lumen of the tube, or, in rarer instances, on the surface of the ovary.

The frequency of this condition can best be estimated from the fact that in the writer's practice about 5 per cent. of all abdominal sections have been for ectopic gestation. The records of other operators would, no doubt, show a similar percentage.

What was formerly regarded as a rare freak of nature has, therefore, through a better knowledge of this condition, and especially our ability of promptly recognizing it, become quite a frequent occurrence.

Ectopic gestation may occur at any time during the childbearing age, but according to Runge[1] it is more frequent near the end of the period than in the early part of it. Women who have borne children are more frequent subjects than nulliparæ, the proportion being as 1 to 6 by the same author; Martin gives it as 1 to 9. In 65 per cent. of the cases of Runge it had been preceded by a period of sterility varying from four to ten years.

Etiology.—Conception in the human female probably occurs in the tube, though the gynecologists are by no means unanimous on this point. Physiologists have long ago recognized the tube as the place in which the ovum is fertilized by the spermatozoa in the lower animal, which they have been able to demonstrate repeatedly by experiments. While in the human female no actual proof is at hand that fecundation takes place in the tube, there are many reasons why we must regard the tube as the seat of the conception, and not the uterus, as the older gynecologists supposed. After fertilization the ovum is pushed along the tubal canal by the action of the cilia lining the epithelium until it reaches the uterine cavity, where it finds a secure resting-place for its future development. Any interference, therefore, with this onward passage of the impregnated ovum through the tubal canal will cause extrauterine pregnancy.

Doederlein found in about 90 per cent. of his cases inflammatory conditions in the tube and their surroundings as the cause of this interference. These inflammatory lesions may be of puerperal origin, but

[1] Beitrag zur Aetiologie Symptomatologie and Therapie d. Extrauteringraviditat, Archiv f. Gynäkol., Bd. 70, p. 690.

unquestionably, in the majority of cases, are due to gonorrhœal infection. This explains the sterility which at least for several years precedes a larger number of these cases. During the acute or more active stages of this inflammation, conception is scarcely expected to take place, and it is only after the Fallopian tube has to a certain extent recovered from the effects of this inflammatory process and when the tubal ostia have remained more or less patulous that such a condition can occur.

As a result of these inflammatory lesions the tubal lumen may have been narrowed, so that the ovum becomes arrested in the strictured portion. Its passage may be made more difficult and tedious on account of the rigidity and infiltration of the tubal walls interfering with its normal peristalsis; the epithelium with its cilia may in patches at least have become destroyed and their wave-like action no longer assists the ovum in its migration through the canal. Adhesions displacing the tubes, and kinks also, perhaps help to narrow their lumen, rendering the passage of the ovum to the uterus slow and difficult. Another cause of narrowing the tubal lumen is given by Opitz, who found in a large number adhesions between the folds of tubal mucous membrane as the only indication of former tubal inflammation.

Not all cases of ectopic gestation, however, can be attributed to previous inflammatory lesions of the adnexa. The writer himself has repeatedly observed perfectly normal tubes the seat of pregnancy in which evidently other etiological factors were at work. Defective development of the tubes, which are usually narrow and tortuous, has, especially by Freund and Frömmel, been accused of favoring tubal pregnancy in nulliparous women. Diverticula and accessory tubes have also been found as causes of ectopic gestation (Micholitch).

External migration of the impregnated ovum has been demonstrated beyond any doubt and to it have been attributed a number of cases of extrauterine pregnancy by such authors as H. C. Coe, J. W. Williams and others. It is explained that by the time the ovum reaches the opposite end of the tube it has grown to an abnormal size and become too large to pass through the canal. Disproportion between the fertilized ovum and the tubal lumen from other causes is also given as a very plausible explanation of extrauterine pregnancy. Rarely polypi and other small neoplasms obstructing the lumen of the tube have been found in tubal gestation. Fright and great mental emotions at the time of conception have been adduced as supposed causes.

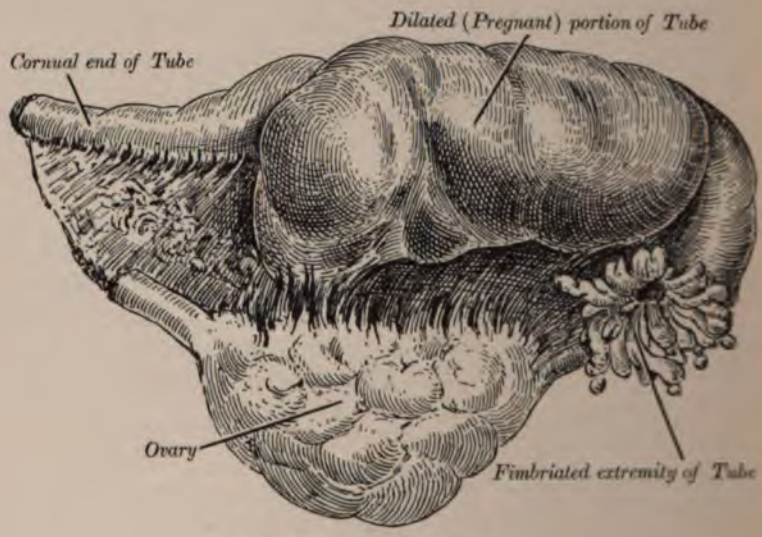
Repeated ectopic pregnancy in the same patient have been observed so frequently that the advisability of removing both tubes as a prophylactic measure has been suggested when operating for this condition.

Coincident *uterine* and *tubal* pregnancy is by no means a rare accident, as has been shown by F. F. Simpson,[1] who has collected 113 cases of this character including his own, which went to term after having the tube, the seat of the misplaced pregnancy, removed.

[1] American Journal of Obstetrics March 1904.

Ectopic pregnancy is divided into primary and secondary or advanced, and the former into *tubal*, *ovarian*, and *abdominal*. The tubal form is by far the most frequent. The ovarian form is very rare, in fact its authenticity has only recently become firmly established since a number of cases has been reported after thorough investigation by very careful and reliable men. Füth[1] has collected 18 cases which leave no reasonable doubt that the ovum was impregnated and developed within the Graafian follicle. Cases of primary abdominal pregnancy have been reported, but according to Veit,[2] who analyzed them very carefully, none of them he regards as absolutely convincing and above suspicion.

FIG. 298



Tubal pregnancy unruptured.

They all probably had their original seat in the tube. He therefore makes a positive sweeping statement, that primary abdominal pregnancy does not occur in the human being, at least has never been unmistakably proven. If it is true that the impregnated ovum requires as its nidus a mucous membrane lined with cylindrical epithelium, it certainly seems altogether impossible for a pregnancy to develop on surfaces covered with peritoneum. This requirement, however, is found both in tubal canal as well as in the Graafian follicle. The connective tissue of the mucous membrane, or rather the loose connective tissue immediately under the epithelium, is the place where the ovum embeds itself; it develops in the mucous membrane and not *upon* it, according to Veit.[3]

[1] Centralblatt f. Gynäk., 1901, No. 12, p. 313.
[2] Verhandlungen d. Deutschen f. Gynäk., 1904.
[3] Ibid.

Tubal pregnancy is termed: 1. Tubouterine when the ovum develops in that portion of the tube situated within the uterine wall.

2. Tubal proper when it is held anywhere within the free tube. It is more frequently found in the ampullar portion or outer third of the tube (Fig. 298).

3. Tubo-ovarian when the ovum attaches itself partly to the tube and partly to the ovary.

The ovum may become partially or even entirely expelled from the tube and may continue to develop by forming new attachments in the abdominal cavity, when the pregnancy is called a *tuboabdominal*, as long as it still retains some of its original attachments in the tube; or secondary abdominal when it has become completely detached from the tube and continues to grow in the abdominal cavity.

Occasionally the tube may become distended in the direction of the broad ligaments or may rupture between the folds of these ligaments without producing death of the fetus when we speak of *intraligamentous pregnancy*. These locations are called secondary forms of tubal pregnancy because they develop secondarily from the original forms which are *tubal*.

ADVANCED ECTOPIC GESTATION.—In rare instances the fetus may reach maturity in its original ovisac without rupture, but in most of the advanced forms of ectopic gestation the embryo has become displaced from its primary seat of development by rupture or abortion. The ovum not having been completely detached, the placental circulation is still sufficient to maintain life in the fetus, which then continues to develop in its new location either within the peritoneal cavity as a secondary abdominal pregnancy or extraperitoneally between the folds of the broad ligaments as an intraligamentary gestation. The life of the fetus, however, may be terminated at any time before reaching its full maturity or it may go to full term, when spurious labor will set in, resulting in the death of the child unless delivered by artificial means. The death of the fetus is then followed by retrogressive changes in both the fetal sac as well as in the fetus proper. The amniotic fluid is gradually absorbed and the placenta and sac shrink. The fetus now being a foreign body excites and stimulates adhesions in the surrounding structures. If the sac surrounding the fetus is still intact it will, according to Leopold, act as a protecting membrane against the peritoneum and a barrier against the entrance of white blood cells and their destructive effect on the fetus; the latter gradually becomes mummified and finally undergoes complete calcification, producing what is termed a lithopædion. In the absence of such protection from the sac walls the white blood cells enter the fetus through the skin and the natural orifices of the body and cause a gradual maceration until only the skeleton of the fetus remains. In case an infection or abscess formation accompanies the disintegration of the fetus, the pus discharges finally through one of the hollow viscera, especially the bladder or rectum, followed by the fetal bones. Cases in which the fetal skeleton has thus found an outlet from the abdominal cavity piecemeal have

frequently been recorded and is therefore no unusual termination of an extrauterine pregnancy. The formation of a lithopædion is less likely to be complicated by a septic infection and being thoroughly walled off and encysted, it is often carried around by the patient for years without producing any marked disturbances of any kind. Kürchenmeister has collected seventy cases of lithopædion from the literature, many of which have been in the human body for from thirty to fifty-seven years without causing any or at least only comparatively trivial symptoms.

Fig. 299

Seven months' living ectopic child. Lived an hour.

The fetus that has reached a viable period is rarely well developed, partly on account of its defective nutrition and partly owing to the narrow and cramped quarters which limit its growth and produce more or less serious compression of its bony structures. This is particularly marked about the cranial bones, which are often pressed out of shape and indented, and also about the bones of the extremities, which are therefore frequently deformed. Even the integument in the writer's case was found excoriated and ulcerated in places where it had been subjected to constant pressure against the maternal bones of the pelvis (Fig. 299).

The accompanying photograph of the author's case well illustrates what has been said regarding this point. They seldom, therefore, survive their delivery very long; in fact, almost 50 per cent. die during the first few days. Of the 22 children collected by the writer[1] who survived that period, 8 are known to have died within the first year and a half; 5 were said to be strong, healthy at birth but no subsequent report could be obtained; 5 lived from six to eleven months, 5 from one to two years, and 2 seven and fourteen years respectively. Sittner found that among 93 ectopic children, 49 (52.6 per cent.) died during the first month, the large majority of them during the first forty-eight hours; 11 children were still alive at the time of his report, varying in age from three months to nineteen and one-

[1] Abdominal Section in Ectopic Gestation when Fetus is Living and Viable with Report of a Successful Case. New York Medical Record, November, 1894.

half years. The prognosis of an ectopic fetus is at best therefore never very hopeful.

Anatomy.—After the ovum has become arrested in the tube its presence no doubt excites an active growth of the muscular elements of the tube, producing hypertrophy as well as hyperplasia of the tubal walls, this action being analogous to that occurring in the uterus during normal pregnancy. The subsequent distention of the tube, however, is accompanied by a corresponding thinning of the walls surrounding the embryo, so that the hypertrophy becomes then only noticeable in those portions of the tube not subjected to this pressure. A decidual formation may occur just the same as in a uterine pregnancy, but it is generally confined to that part of the tubal mucosa immediately in contact with the ovum. The endometrium being a much thicker and heavier structure and much better adapted for the purpose of procreation than either the mucous membrane of the tube or ovarian follicle, the decidual reaction following the implantation of the ovum is much less pronounced than that occurring in the uterus; the decidual formation is, therefore, often an abortive or very defective result. Many observers were unable to find a decidua reflexa, which Martin explains by the fact that specimens are frequently not sufficiently well preserved or have become damaged from the presence of blood clots, making it difficult to find these structures, rather than by their absence. Zedel accounts for this absence of the decidua reflexa in certain specimens by adhesions which have taken place between the decidua vera and reflexa. More recently, however, other investigators (Lindenthal, Kroening, and Kuehne) have been unable to discover any evidences of decidual tissue at all in the tube. Lange's[1] careful investigations showed the complete absence of all decidual elements in 14 out of 20 cases; in 4 cases their presence was doubtful, and in only 2 was he able to demonstrate a decidua. These most recent researches cast, therefore, considerable doubt on the generally accepted assumption that a decidua accompanies the large majority of tubal gestation, and further investigations are necessary to settle this question. The fact that most embryos are dead and often partly destroyed when submitted to histological examination no doubt greatly complicates these investigations. There is still more uncertainty about a decidual formation in ovarian pregnancy. While C. V. Tussenbroeck found no decidual tissue in the region of the ovarian follicle, Franz[2] describes a defective decidual formation.

The uterus also undergoes changes of the same character as it does at the beginning of a normal pregnancy. It becomes hypertrophic and its endometrium changes into a decidual membrane. The uterus is, therefore, usually considerably enlarged during the development of the ectopic embryo and its death is followed by the expulsion of decidual tissue.

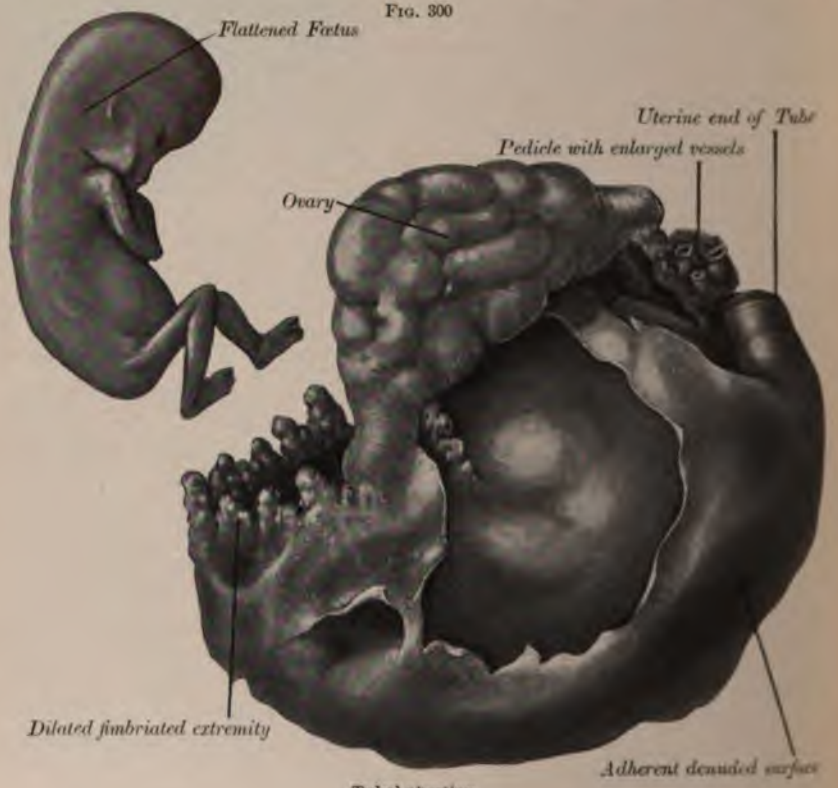
Termination of Tubal Pregnancy.—The defective development of the decidual membrane in many cases, and the poor, unfavorable soil as

[1] Monatschrift f. Geburts. und Gynäk., Bd. xv. Heft 1.

[2] Veit, ibid.

compared with the uterus, along with the narrow, hampered quarters greatly interfere with natural growth and expansion of the growing fetus, and sufficiently explain why pregnancy so rarely reaches maturity. According to Winckel only 6 per cent. go to full term, and even that seems a too high estimate; in all the others pregnancy is usually terminated between the first and third month, in the majority of them

FIG. 300



Tubal abortion.

before the end of the second month. The method of termination is either by tubal abortion or by rupture.

ABORTION.—Recent investigations have shown that tubal abortion is much more frequent than had been supposed, in fact it seems to be the most common termination. Martin found the proportion of rupture to abortion as 1 to 1.42. Others give a much higher rate in favor of abortion, Fehling stating it as 1 to 8, and Doederlein 1 to 10. It seems a safe assertion, therefore, that abortion is at least as frequent as rupture. It is usually preceded by the death of the fetus, and coincident with it cessation of growth and a gradual loosening of the ovum from its attachments. How long the dead embryo may be retained in the tube is still unknown, though it is quite probable that that may be for

weeks. The tubal contractions, however, which are occasioned by the foreign body in the tube usually cause an early expulsion into the peritoneal cavity. This detachment of the ovum is accompanied by more or less bleeding, at first only between the fetal membranes or between the ovisac and tubal wall. If the hemorrhage be slight, the blood may coagulate in the tube, surrounding and infiltrating the ovum and tubal walls, leaving the tube more or less permanently damaged, but producing no very active or serious symptoms. The embryo then becomes so changed that nothing but a mole remains—*i. e.*, a large blood clot containing some placental tissue. The hemorrhage often becomes profuse and free, the blood being discharged through the abdominal ostium into the peritoneal cavity, where it may fill the whole cavity if the effusion be very large; or if smaller and the flow be slow and gradual, it may settle around the fimbriated extremity or gravitate down into Douglas' cul-de-sac, forming a pelvic hæmatocele.

RUPTURE.—Rupture is usually caused by hemorrhage into the tube between the ovum and tubal wall, the latter having already been distended and weakened from the pressure of the growing embryo. Tubal contractions at this time no doubt greatly help to bring on this catastrophe. In addition to this overdistention may be mentioned as a predisposing cause, deep penetration of the chorionic villi into the tubal tissue as has been observed by Leopold, which may partly or completely perforate the tubal sac. A fall or other form of traumatism seems at times to be the immediate cause of the rupture.

The rupture is always accompanied by more or less profuse hemorrhage from the vessel of the placental site at or near which the rent usually occurs. Rupture generally results in the death of the fetus, which is extruded through the rent into the abdominal cavity, where it may become lost among the blood clots and become absorbed, which especially when very young can be accomplished in a very short time, according to the experiments of Leopold. The fact is that in operations performed for this condition the fetus is found only in a small percentage of cases. In 610 cases collected by v. Schrenk it was found 250 times; Martin in 77 cases found it 33 times; in the 88 cases reported by Runge it was found only 17 times.

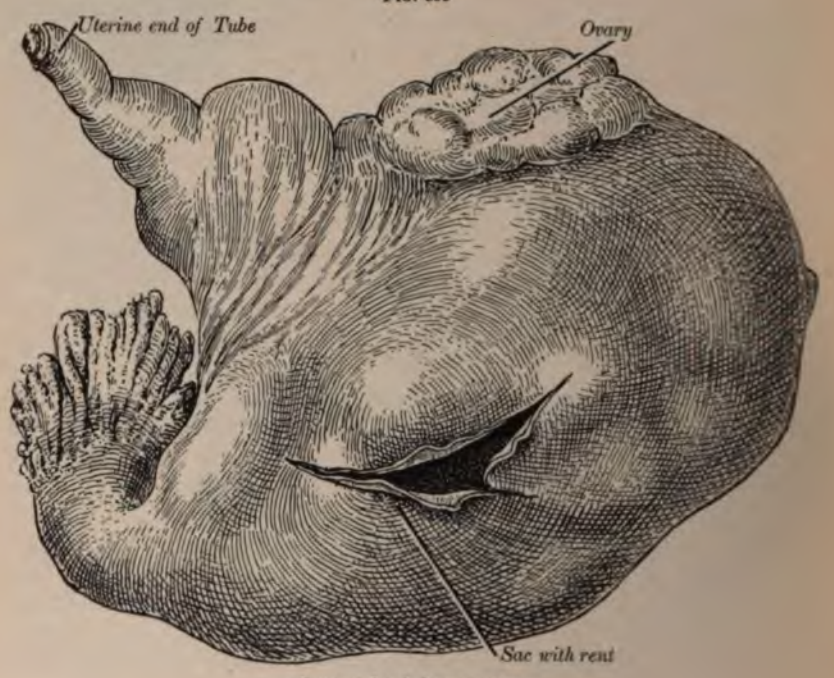
Should rupture occur in the posterior surface of the tube the blood and ovum may discharge not into the peritoneal cavity but between the folds of the broad ligaments, forming a hæmatoma. If the embryo should still retain some of its attachments to the tube at the time of rupture death would not necessarily take place, and it may continue to develop in that case to maturity within the layers of the broad ligaments as an *intraligamentary pregnancy*. Even when the rupture has occurred into the free peritoneal cavity the ovum may only partly become extruded from the lumen of the tube, retaining sufficient attachment to its original seat of development to enable it to survive this catastrophe and continue to grow in the abdominal cavity, forming thereby a *secondary abdominal pregnancy*.

In ovarian pregnancy rupture also usually terminates the life of the

embryo or the embryo may die early and remain in the follicle until hemorrhage into the intervillous space increases the intrafollicular pressure, causing a rent in the follicle. The ovum then drops into the general peritoneal cavity and more or less free hemorrhage takes place, just the same as in the tubal form.

Hæmatocele and Hæmatoma.—Unless the ovisac has formed very firm adhesions to its surroundings, rupture of the tube and generally also tubal abortion will be accompanied by more or less free hemor-

FIG. 301



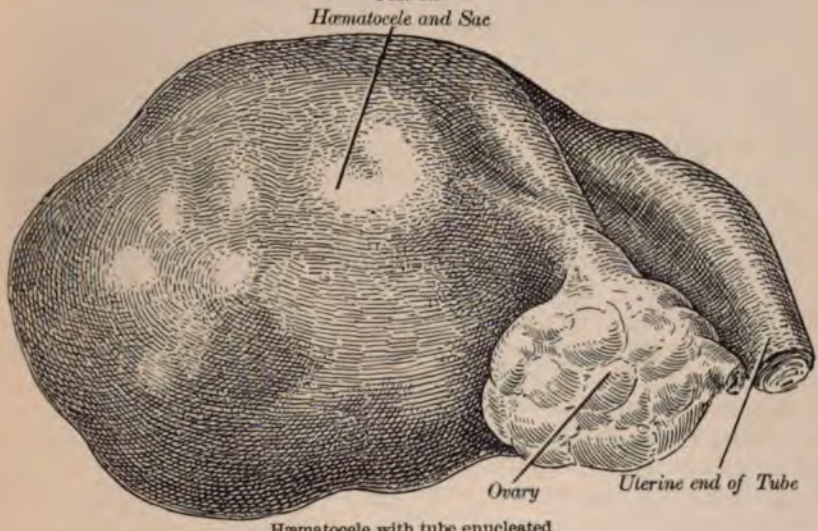
Ruptured tubal pregnancy.

rhage into the general peritoneal or pelvic cavity. The quantities of blood thus poured into the abdomen are often enormous, several quarts. Contrary to Tait's teaching that blood in the peritoneal cavity shows little tendency to coagulate, we know that especially when adhesions about the tube have existed previous to rupture coagulation takes place very promptly, but even in the absence of such adhesions the blood gradually gravitates to the lowest point, which is the pelvis, where the coagula form into a mass which becomes organized and surrounded by a firm capsule, while the blood serum is rapidly absorbed. This is particularly the case when the hemorrhage comes on at different intervals with periods of freedom between them. The writer has observed three different kinds of blood in the abdomen, as indicated by the degree of coagulation and color of the blood, evidently belonging to

three different distinct hemorrhages with probably several days of an interval between each. Dark coagula were found, partly organized, evidently belonging to the first hemorrhage, then dark fluid blood, which must have entered the peritoneal cavity a few days later, and finally bright red blood, which was seen pumping out of the bleeding vessels.

These hæmatoceles are most commonly situated around the tubal adhesions or in Douglas' pouch behind the uterus, the lowest portion of the pelvis where it may not only distend the cul-de-sac until it almost reaches the vaginal outlet, but it may push the uterus up in the direction of the abdominal cavity and against the symphysis, the cervix being then often entirely out of reach. This is called a retrouterine hæmatocele. Occasionally the blood collects in the space between the

FIG. 302



Hæmatocele with tube enucleated.

bladder and uterus when it is termed anteuterine hæmatocele. The location of the hæmatocele depends not only on the position of the tube, but also on the quantity of the blood effused and the rapidity of the hemorrhage. When the bleeding is very profuse and in large quantities, not only the pelvis is filled up but also the lower abdomen, and with the patient in the dorsal position also the flanks. The coagulated blood mass is then bounded in front by the uterus and broad ligaments, and when very large even the anterior abdominal wall, and above by intestines which are adherent to themselves, as well as to the hæmatocele. Sänger differentiates between a *diffuse hæmatocele* which fills up the pelvis, is not circumscribed, but which reaches to the right and left pelvic wall, and is surrounded above by adherent coils of intestines, and a solitary hæmatocele which is circumscribed on all sides, reaching with its upper convex surface into the abdominal cavity surrounded

by a capsule from which it can be enucleated like a fibroid tumor. The wall of this capsule consists of fibrin, which under the microscope shows marked similarity to connective tissue and non-striated muscular fibres.

Hæmatocele in contradistinction to hæmatoma is a collection of blood in the peritoneal cavity, while the term hæmatoma is applied to hemorrhagic conditions in tissues which are extraperitoneal. Hæmatoceles with very rare exceptions are results of ectopic gestation. The writer has only once seen a considerable quantity of blood in the abdomen which was supposed to be extrauterine pregnancy, but in which the most searching examination failed to find any elements of pregnancy, the hemorrhage having been due to a ruptured Graafian follicle. The specimen was examined by Welch, of the Johns Hopkins Hospital, who confirmed our diagnosis.

Hæmatoma occurs in those rare instances where ruptures of the tube takes place within the folds of the broad ligaments. The blood in these cases may be confined to one side of the broad ligament, in which case the uterus is pushed over to the opposite side, or when the bleeding has been very profuse the whole ligament may become an enormous blood sac. Hæmatoma as compared with hæmatocele in extrauterine pregnancy is rare; the writer has only seen two undoubted cases of this character in at least a hundred cases which have come under his observation.

Infection of Hæmatocele and Hæmatoma.—Infection of hæmatocele and hæmatoma is of frequent occurrence and is always to be feared and looked for. The organisms responsible for this infection may be derived from the impregnated tube or may find entrance into the hæmatocele from the surrounding and adherent intestines.

Interstitial Pregnancy.—Interstitial pregnancy is the rarest form of tubal gestation. The embryo develops in that portion of the tube situated in the uterine wall, the uterine cornu, which then becomes swollen, the whole uterus participating more or less in this enlargement. Characteristic of this form of pregnancy and of great diagnostic value is the location of the round ligament, which is constantly found external to the sac, while in all other forms of tubal pregnancy the ligament is in the inside. The uterine wall surrounding the ovum becomes distended both toward the uterine cavity, as well as in the direction of the peritoneal cavity. With the growth of the embryo there is a corresponding thinning of the muscular tissue until it finally terminates in rupture into the abdominal cavity. In rare instances the distention may be in the direction of the uterine cavity until the embryo may finally break through the endometrium into the uterine cavity, from which it is then expelled as in a normal pregnancy. Such cases have been observed by Braxton Hicks and Martin.

Symptoms of Ectopic Gestation.—In the beginning are generally those of an ordinary pregnancy. Cessation of menstruation is the rule, though in 30 per cent. of the cases observed by the writer there was no interruption of the catamenial flow. Nausea and vomiting do not

seem to be as common, and when present less severe than in normal pregnancy according to the experience of the author. In the more advanced forms the breast signs do not vary from those ordinarily found in pregnancy; there is also the same increased vascularity in the vaginal mucous membrane with the characteristic discoloration of the vulva and more or less softening of the external os, though perhaps a little less marked than in the uterine form. Pains referable to the side on which impregnation exists are generally complained of; they are often colicky in character, come on in paroxysms, and may last for days or only a few minutes. They are probably due to tubal contractions. Backache and pains in the lower abdomen are also experienced in most cases, especially before and during the first days of uterine bleeding, which may be explained by the uterine contractions which undoubtedly occur at this time simultaneously with the detachment and expulsion of the uterine decidua. These pains are often described as bearing down and expulsive in character.

Many patients, however, are in perfect health without the slightest evidence of such a serious pathological lesion until the first evidences of rupture or abortion manifest themselves. The symptomatology, therefore, presents nothing characteristic up to this period. The objective signs are those usually found in normal pregnancy above alluded to. The uterus is found more or less enlarged, and a very careful examination may disclose even at a very early period a small enlargement of the impregnated tube, perhaps not larger than a hickory nut As gestation advances this swelling increases in size, it is round or pear-shaped, firm but elastic, and frequently distinctly pulsating. As the tubal mass increases it tends to push the uterus to the opposite direction, so that more or less lateral uterine displacements may be expected toward the end of the second or beginning of the third month. If the enlarged tube through its overweight falls into Douglas' pouch, the uterine displacement may be in a forward and upward direction, and may result in more or less irritability of the bladder or by pressure on the rectum cause rectal tenesmus.

The pains accompanying abortion and especially rupture are often of an agonizing character, described frequently as tearing in character, sometimes, however, as something like labor pains, coming on suddenly, not rarely during some physical exertion, producing intense prostration, syncope, and at times more or less profound collapse. The patient is found cold and clammy, pulse extremely feeble, thread-like and rapid, and sometimes hardly palpable; before long the patient shows marked evidences of anæmia, even to the point of exsanguination. Pains and more or less collapse and other evidences of internal hemorrhage may within a day or two subside and the patient feels well enough to venture out of bed, when after an interval of a few days or weeks or even longer period a recurrence of the same phenomena may take place. The writer has in more than a few cases seen the complex of symptoms above described recur two or three times after such short intervals, indicating a renewal of hemorrhage. These secondary hemor-

rhages, to which the patient may succumb after they seem on a fair way to recovery, are probably due to incomplete extrusion of the embryo at the first attack and plugging up of the bleeding points. Preceding these symptoms sometimes for days or simultaneously there is a bloody discharge from the vagina, not sufficient, however, in amount to account for the sudden anæmia. The abdomen becomes exceedingly tender to the touch, more or less distended, nausea, and vomiting are generally present. The bloody discharge frequently contains evidences of membranous tissue, shreds of decidua, sometimes such small fragments that they, in the majority of cases, escape detection both on the part of the patient as well as the physician; occasionally, however, the whole decidua becomes expelled in one mass representing a regular cast of the uterine cavity.

The symptoms are, however, not always so marked and characteristic, especially when the gestation ends in tubal abortion. The pain is then often of a passing character, not marked by unusual severity or accompanied by any decided shock or anæmia. The writer has seen a large number of cases presenting themselves with hæmatoceles of considerable size, who had not even been in bed more than a few hours at a time and showed in their subjective symptomatology nothing which could have been interpreted as indicating the presence of tubal pregnancy unless possibly the absence of one or two menstrual periods followed perhaps by more or less prolonged bloody vaginal discharge.

Diagnosis during First Three Months.—Diagnosis before rupture is rarely made, not so much, in the writer's opinion, because of any unusual difficulties, but because so few patients find it necessary to consult a physician until the termination period is reached, the symptoms, if present, being usually those of pregnancy. Neither the patient nor the physician have any reasons to suspect anything out of the ordinary unless the pains from tubal contractions or uterine colic should be severe enough to require medical aid. A careful bimanual examination would then find the uterus probably not corresponding in size to date of last menstruation; there may be some lateral displacement of that organ caused by a globular or pear-shaped mass closely connected with the womb either on the side or in Douglas' cul-de-sac. This mass is usually quite tender to the touch, tense but elastic, and distinctly pulsating. Repeated examinations at intervals of several days will show a gradual but continuous increase in size, while the uterus itself remains more or less stationary.

When abortion or rupture occurs the symptoms are so marked and undoubted in character that the diagnosis usually presents no difficulties whatever. A patient who gives a history of pregnancy is suddenly seized with an acute paroxysm of anæmia not pronounced. The diagnosis in such cases must be based mainly on the history of one or two missed periods followed by irregular bleeding, accompanied by more or less expulsive uterine pains and the presence of a pelvic tumor, usually behind or to one side of the uterus, which latter has become

somewhat displaced by it. These are the cases that are often treated for incomplete abortion, though a careful investigation and due consideration of the above points could hardly fail to place us on the right track.

Diagnosis.—Until the first month when the characteristic signs of pregnancy are found, the history of the case, with a rather rapidly growing tumor which is very vascular as shown by distinctly pulsating vessels and purplish discoloration of the vaginal outlet, and the breast signs are about all the evidences we have that might lead us to suspect the presence of an ectopic gestation. That many errors in diagnosis must occur, therefore, at this period can easily be understood, as the symptoms indicating an extrauterine pregnancy at an earlier period may have been very slight, and the tumor itself may closely resemble an intraligamentous or firmly adherent ovarian cyst, or a fibroid neoplasm. After the middle of pregnancy has been reached, however, the fetal movements, the placental souffle, and finally the fetal heart sounds along with other symptoms of gestation usually make the presence of pregnancy clear enough. The difficulty now is to differentiate between a normal uterine and an ectopic pregnancy. In the latter the fetus can generally be much more distinctly palpated than when the child is contained in the uterus; when low in the pelvis it may feel as if merely the thin vaginal mucous membrane was between the fetus and the examining finger; portions of the fetus also may be felt directly under the abdominal walls, as if lying free in the abdominal cavity. The fetal tumor is usually in the lateral portion of the pelvis, while the axis of the uterus points to the opposite side.

Pain is usually a prominent symptom in ectopic gestation and is considerably increased by pressure and palpation, so that a careful and satisfactory examination is generally impossible without anæsthesia. The cervix, or at least the uterus, is generally markedly displaced to one side of the pelvis; if the tumor is behind it may be pushed against the symphysis; the os is usually softened or even patulous as in a normal pregnancy. In the two cases of viable fetus which came under the writer's observation the two lower thirds of the uterus could be distinctly mapped out and separated from the tumor, and also the outer portion of the fundus, but the inner portion—*i. e.*, the part of the uterus attached to the tumor—was so merged with the fetal sac that it could not be palpated and differentiated. By making firm traction from the cervix with a tenaculum forceps we may force the uterus down and separate it from the ectopic tumor so as to enable us to get a complete outline of its body, especially if we make an examination per rectum, which often has considerable advantage over the vaginal examination. The introduction of a sound or, when the cervix is sufficiently patulous, of the finger into the cervical canal may greatly assist us in learning the direction of the uterus and the capacity of its cavity.

The cases of uterine pregnancy in which the fetus dilates one-half of the uterine cavity, thinning out its walls until they become almost membranous, while the other half remains firm and contracted, often

give rise to the erroneous diagnosis of extrauterine pregnancy, and many expert diagnosticians have not discovered the true condition of affairs until they have opened the abdomen. In such cases, it is very easy to mistake the dilated portion of the uterus for the ectopic sac, while the contracted portion strongly resembles the empty uterine body. In some extremely puzzling cases of this character the writer was enabled to recognize the condition by carefully and gently inserting the finger under anæsthesia into the dilatable cervical canal up beyond the internal os, when the fetal membranes could be made out plainly and distinctly. In none of the cases has the examination been followed by any harm to the patient nor has it caused any premature interruption of pregnancy, and when practised with care and the usual antiseptic precautions it can be recommended as a valuable aid in making the differential diagnosis in those often extremely difficult cases. Even more difficult to diagnosticate from an ectopic gestation are the fortunately rare cases of advanced pregnancy in a retroflexed adherent uterus, or in the uterine cornu.

Differential Diagnosis.—Normal pregnancy with a tumor near the uterus may give rise to symptoms strongly resembling ectopic gestation. On two occasions the writer was called upon to decide between a torsion of the pedicle of a small ovarian cyst and tubal pregnancy, one case being complicated by a normal pregnancy. An incomplete uterine abortion under such circumstances would render the diagnosis not only extremely difficult, but absolutely impossible. The treatment being practically the same, no serious harm would result to the patient, however, should a mistake in the diagnosis be made. Again, a ruptured pyosalpinx may be accompanied by such violent pains, coming on suddenly, that a differential diagnosis may be extremely difficult, though the history of the case, the high temperature, and the active inflammatory process promptly following this accident, as well as the absence of internal hemorrhage and uterine bleeding, are very strong factors against tubal pregnancy. Appendicitis and a pyosalpinx may at times present such clinical features as to lead us to suspect ectopic gestation, and mistakes of this nature have not rarely occurred. Whether a curettement of the uterus for the purpose of obtaining uterine scrapings for microscopic examination would greatly help us in such unusually difficult cases is more than doubtful. Martin in a number of undoubted tubal pregnancies failed to find decidual tissue, while in a pyosalpinx the tissues under the microscope strongly resembled decidual membrane. No absolute reliance can, therefore, be placed on such microscopic findings, not to speak of the risk to the patient with such an interference under such circumstances might entail. A better and safer procedure in cases when the diagnosis presents much exceptional difficulties would be a posterior colpotomy which would permit the introduction of one or two fingers through Douglas' cul-de-sac for the purpose of exploring the pelvic contents, should this be necessary.

Diagnosis of Hæmatocele.—In the course of forty-eight hours, if the patient has survived the catastrophe, the clinical picture, particu-

larly the physical signs, will usually have changed considerably. The effused blood by that time has settled to the most dependent points, if the hæmatocele be a diffuse one and has become condensed and coagula have formed. The distention of the abdomen is now more confined to the lower portion between umbilicus and pubes, where the palpating fingers are able to make out a distinct resistant, tender mass usually occupying one of the lower quadrants more or less completely. Bimanual examination finds Douglas' pouch much distended and pushed down toward the vaginal outlet, giving a doughy, elastic, almost fluctuating feel to the touch; the uterus is pushed to one side or pressed against the symphysis pubes and can with difficulty be differentiated from the large, rather undefined mass, filling the lower abdomen and more or less of the pelvis. In the course of a few days the tumor becomes harder, its outlines more distinct, the pouch of Douglas more tense and firm. Bladder and rectum become crowded, the patient now refers to the pain in the back and down her legs and complains of bladder and rectal tenesmus and a great fulness and discomfort in the pelvis. There is usually some elevation of temperature and marked derangement of the digestive tract. Should an infection of the hæmatocele take place, chills may set in with high evening temperature, increased pain and tenderness in the pelvis. The tumor enlarges and the abdomen over it becomes more prominent, the cul-de-sac more distended, often filling out the whole vagina and presenting at the vaginal outlet as a firm, elastic, almost fluctuating tumor. When the hæmatocele is solitary, the tumor is smaller, confined to the retrouterine space or to the side of the pelvis. It gradually hardens and under favorable conditions rapid absorption may go on, leaving, however, the embedded tube more or less permanently damaged.

In the rare instances, when an extraperitoneal hæmatoma between the layers of the broad ligaments develops, the symptoms accompanying this condition are less prominent than in the intraperitoneal forms, pain is less violent and decided anæmia and collapse generally wanting, but on account of the pressure of the blood tumor on bladder and rectum dysuria and rectal tenesmus are usually very marked and distressing.

Prognosis.—The existence of ectopic gestation is always an exceedingly grave and dangerous condition, the prognosis of which largely depends on its prompt recognition, watchful care and skilful surgical treatment. The extremely unfavorable views entertained by the older gynecologists, however, hardly hold good to-day with our present knowledge of its pathology and our increased experience in its treatment. Very few of us would be willing to subscribe to the statement made by Lawson Tait, less than twenty years ago, when he said that "I have never seen a case of suspected rupture or one in which we suspected an intraperitoneal effusion of blood recover if left alone." Since we have learned that the termination by rupture is not as frequent as formerly supposed and that the majority of ectopic embryos die during the first and second month, and that probably most of them terminate by abortion and not by rupture, we look upon this condition with less terror than formerly.

The earlier the ovum perishes the less trouble is caused by its detachment and absorption, and experience has shown that many such extremely young embryos disappear with comparatively slight disturbance. Most of the cases reaching our hospitals have in fact already passed the most critical period of abortion or rupture and present themselves with a hæmatocele of longer or shorter duration. The really grave cases are those which reach the end of the second and third months of development when rupture is the more usual termination and when even abortion is not rarely accompanied by very serious hemorrhage with fatal termination, or at least the formation of a large diffuse hæmatocele which, while not immediately destructive to life, causes a prolonged and dangerous illness and often leads to more or less permanent invalidism.

Treatment of Ectopic Gestation during the Early Months.—The general consensus of opinion among gynecologists of the present day favors the removal of the ovisac as soon as the diagnosis is made. If this can be done before rupture or abortion has taken place, an immediate operation will prevent the serious consequences accompanying the termination of pregnancy. According to Werth an ectopic gestation should be considered like a malignant growth, whose prompt removal should be urged at all times. Other methods in vogue several years ago, whose object was the killing of the fetus, are at the present time with almost uniform success of the operative treatment not only inadvisable, but scarcely justifiable, as they are unreliable, and even if successful as far as the death of the fetus is concerned, they leave the ovisac and with it many possibilities of serious complications to which the patient may subsequently become exposed. One of these methods of the treatment is the injection of morphine into the impregnated tube, advocated and practised principally by Winckel. Another is the application of the galvanic current to the ovisac, which was especially recommended by Apostoli and his followers. Both of these methods of treatment have now become entirely obsolete and had to make way for the operative treatment which is the only rational and safe means of dealing with this condition.

While the sac is intact the operation is practically that of a simple salpingo-oöphorectomy, and with a proper technique should be entirely devoid of mortality. When the patient is found bleeding into the abdomen, as a result of rupture or abortion, the necessity of prompt operative intervention is still more urgent. No matter how much collapsed and blanched the patient may be even when in a pulseless condition, an attempt should be made to save her life by at once, without delay, opening the abdomen. In such desperate cases it is advisable when possible to have an assistant give an intravenous infusion of normal salt solution while the preparations for the operation are going on, at the same time administering stimulants in the form of strychnine and camphor hypodermically in large doses. The operation under such circumstances should be done rapidly, with as little delay as possible. Very few instruments suffice, a scalpel, a few hæmostatic forceps, a pair

of scissors, and a few needles and silk; in fact, the instruments contained in an ordinary pocket case are all that are required in such an emergency. Large quantities of sterile water should be on hand, however, for making normal salt solution, both for the purpose of irrigating the abdominal cavity, as well as leaving several quarts of this fluid in the abdomen. After the abdomen is opened by a fairly free incision the operator should at once introduce two fingers into the pelvis grasp the tube, which is the source of hemorrhage, rapidly, break up any adhesions and bring it up into the abdominal incision. Two clamps should then be applied—one to the infundibulopelvic ligament, compressing the ovarian artery, and the other to the uterine end of the broad ligament, thus checking all bleeding completely. The tube and ovary can now be amputated above the forceps. The operator has now time, if the condition of the patient will permit, to turn out the clots of blood from the peritoneal cavity before he applies his ligatures. After the pedicle has been securely ligated, pitchers full of normal salt solution can be poured into the abdomen by means of which, especially if done with some force, the blood coagula can be washed out more thoroughly and in less time than they could be removed by any other means and with less injury to the peritoneal viscera.

The question is often raised whether all blood should be removed from the abdominal cavity before closing the wound. This will largely depend upon the condition of the patient. It is very desirable that the abdomen should be left as dry and clean as possible, as in all other abdominal operations. If the patient is very weak, however, and her pulse very rapid and thready, the blood clots at least should be washed out as thoroughly as possible in the manner indicated. This can be accomplished usually in a couple of minutes. The normal salt solution left in the abdomen will then sufficiently liquefy and dilute any remaining blood in the peritoneal cavity to allow of its rapid absorption, and at the same time it will greatly stimulate the patient and speedily fill up the drained bloodvessels. The writer's practice is to leave several quarts of this normal salt solution in the abdomen and to close the wound without drainage, and he has seen only good results from this treatment. The patient is then placed in bed, the foot of which is raised from twenty-four to thirty-six inches, making use of Clark's position for the double purpose of overcoming the shock and anæmia, as well as aiding the rapid absorption of the bloody fluid and normal salt solution left in the abdominal cavity.

If the patient's condition at the time of the operation is good and not perilous an examination of the other ovary and tube should be made, and whatever operative measures may be required on that side should be added at the same time. When time is no object and very speedy work not necessary, conservative surgery may be practised on the afflicted side by leaving the ovary, if healthy, and simply removing the tube. Martin and others have even tried to save the tube by simply splitting it open and turning out all clots and placental tissue and then carefully closing the tube by fine catgut sutures, thus preserving not only the

ovary but also the tube. No effort at conservative work should be made, however, when the patient is in a precarious condition, as no time should be lost under those circumstances and the typical operation of salpingo-oöphorectomy can be done more quickly and safely than some of its conservative modifications. At this time the saving of life is the object of our operation and the fineries of pelvic surgery, which often take up much time, are here of no vital importance.

When a large bloody effusion has taken place into the abdomen and the bleeding seems to be, at least temporarily, checked and the patient shows evidences of reviving from the shock and anæmia, it will often be a very perplexing question for the surgeon to decide whether immediate operation should be done or whether it would be safer for the patient to be allowed to rally somewhat before resorting to operative treatment. Much depends under these circumstances on the surroundings of the patient and the watchful and intelligent care of her attendants who can be trusted to recognize the slightest return of hemorrhage and be prepared for immediate operative interference, at a moment's notice, should such become necessary. The surgeon will often require all his judgment and ripe experience to be able to individualize and take the right steps at the proper time. While a fatal result may be the outcome of too hasty operative interference in a patient who is too debilitated to stand the shock of such a procedure, when a short delay might have revived her sufficiently to stand the ordeal, we, on the other hand, are liable to let a valuable life slip through our fingers on account of our procrastination and want of action before too late.

The operative treatment of ovarian pregnancy is practically that of the tubal form, that is, the removal of the gestation sac which, in this case, is in the ovary instead of the tube; the operation, therefore, being really an ovariotomy.

In the interstitial form the ideal operation would be the excision of the sac and its contents from the uterine wall, bringing the wound surface together by deep and superficial catgut sutures, the technique being similar to that of a myomectomy. When very rapid operating is essential on account of the precarious condition of the patient, the writer knows of no operation that can be done safely in as short a time as the Hegar operation of hysterectomy with extraperitoneal treatment of the pedicle. An elastic ligature is tied around the uterus below the point where we wish to amputate and is secured by two pins passed immediately above the ligature through the uterus at right angles to each other; the uterus is then amputated and the stump secured in the lower angle of the wound. Ordinarily, however, when suprapubic amputation of the uterus is necessary the intraperitoneal method is preferable. It has been recommended to drain the gestation sac into the uterine cavity by establishing a communication between the two, and Engström in a case successfully carried out this procedure and then closed the wound in the uterine wall by sutures.

Treatment of Hæmatocele.—When the patient has safely passed over the critical period of hemorrhage and comes under the surgeon's care

with a more or less organized blood mass, a hæmatocelè, in her pelvis or abdomen, our course of action is not so plainly laid out for us as during the previous period. Hæmatoceles, if left to nature and treated by the expectant plan, in a large percentage of cases undergo absorption, and while this may be slow and tedious and not infrequently interrupted by accidents and complications, yet the tendency is to spontaneous recovery.

Probably the majority of surgeons see an indication for operation only in those cases where absorption does not take place or is unusually delayed, or when the patient suffers much pain and distress from pressure on other organs, or when septic infection or suppuration of the blood tumor has set in or is threatened. While in a general way the expectant plan of treatment has many advantages, it has also a number of objectionable features, so that the course to be pursued should be carefully considered and weighed in each individual case. The formation of a hæmatocele is by no means a positive proof that a renewal of hemorrhage may not again take place, because the literature contains many reports of such accidents, though the fetus was dead, even with the fatal issue. Careful and constant watchfulness is, therefore, necessary for weeks before we can feel safe against such a recurrence of bleeding. The danger of infection is also always to be kept in mind, and when that occurs an immediate operation is, of course, indispensable. But, even aside from these serious complications, the patient often suffers much pain and discomfort for many weeks, which frequently require the use of anodynes for their relief. The absorption is often very slow and protracted, especially when the effusion is large, and the patients get tired of their confinement in bed and their long convalescence, often extending over a period of months. Even if absorption does take place, numerous and annoying adhesions persist and interfere greatly with the well-being of the patient. An operation will remove all the dangerous complications of this condition, will greatly lessen the period of convalescence, will save the patient much pain and suffering, and will usually leave her pelvis in much better condition, and the patient much better off than she would have been had she been left to a spontaneous recovery. The mortality attending the operative treatment is so slight and the ultimate results so good that the patients, when the matter is duly placed before them, will generally choose operation without much hesitation and assume cheerfully the slight risk attending it. At least such is the experience of the writer, and no doubt of all operators, and the tendency is, therefore, constantly increasing to subject patients, at least with large hæmatoceles, to operative treatment, leaving only the smaller ones, and those showing evidences of rapid and complete absorption and attended with little disturbance and suffering, to the expectant plan of treatment.

In the operative treatment of hæmatocele, just as in ruptured tubes, the abdominal route should be selected. The vaginal route, the writer is well aware, has many advocates, but complete enucleation of the blood tumor, which should always be attempted and can generally be

accomplished with ease, can only be successfully carried out through an abdominal incision. Hæmatoceles are usually extensively surrounded by intestinal adhesions which have to be separated with great care, the bleeding points carefully secured, oozing and raw surfaces drawn together and covered up with healthy serosa by fine silk sutures, things which it is impossible to do with the same safety and thoroughness by the vaginal method. By the abdominal route alone can we get a complete and satisfactory view and sufficient room to enable us to make the necessary repairs in the damaged structures and at the same time control all oozing points. Several years ago the writer undertook to treat such a case per vaginam, after reading of Kelly's successful work in that line, but the attempt to remove the coagula and placenta was followed by such a gushof blood from the placental site that it became necessary to open the abdomen in the greatest haste to save the patient's life.

The vaginal operation, however, has a distinct place in the treatment of infected and suppurating hæmatoceles and also in hæmatoma of the broad ligament, which are best treated by a free vaginal incision and drainage of the sac. For this purpose one or, better, two large rubber drainage tubes are introduced in the cavity, and the lower ends are stitched to the vaginal mucous membrane to prevent their slipping into the pelvic cavity or dropping out of the vagina. The abscess cavity can then be daily washed out with an antiseptic solution through these rubber drainage tubes until it finally becomes obliterated.

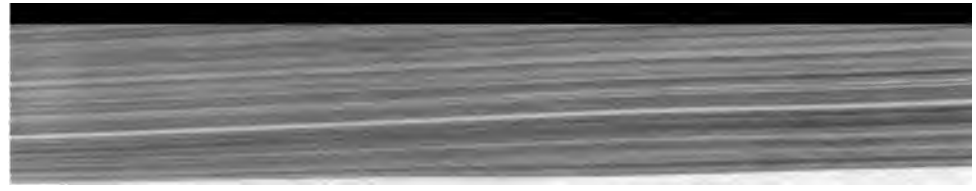
The conservative plan of treatment of hæmatocele consists in the first place in absolute rest in bed, extending over a period of weeks and months, until a recurrence of hemorrhage is no longer to be feared and absorption is pretty well under way. At first ice-bags over the abdomen to prevent hemorrhage and lessen the danger of infection should be applied, which later, however, may be followed by heat by means of moist compresses covered with impermeable bandages, and hot vaginal douches, as these latter seem better adapted for the purpose of hastening absorption. Iodine preparations, ichthyol, sitz baths, etc., may also greatly assist in this process. In addition to this a good nutritious diet and general tonic treatment is indicated.

Treatment of Advanced Ectopic Gestation.—The time of operation is still a matter of dispute. The majority of operators absolutely disregard the life of the child and advocate operative treatment as soon as the diagnosis is made, for the reason that delay often jeopardizes the life of the mother, while the chances of saving the ectopic child are so small that little consideration should be given it. The welfare of the mother is, of course, of prime importance, but when the case can be kept under strict surveillance and her condition carefully watched, so that an immediate operation can be done should an emergency arise, we should in the interest of the child defer operation until viability has been reached. The writer, however, would not go as far as Tait, Dunning, and Ross, who advise delay until false labor sets in, but would favor delivering at the end of the eighth month, partly to save the mother a long, anxious suspense and to prevent accidents which are particularly

PLATE LVIII.

Secondary Abdominal Pregnancy at Eight Months, Primarily Tubal.

The primary attachment of the placenta is plainly discernible at the original tubal site. After rupture the placenta grew and became attached to a large surface on the anterior abdominal wall. The child was delivered through a retrouterine vaginal incision. (Jewett.)



liable to happen at the termination of pregnancy, such as rupture of gestation sac or separation of placenta, and partly because the child would be smaller, the amniotic fluid more copious, and the child less subject to compression and subsequent deformity.

The greatest danger in the operation during the life of the child is the placenta, the removal of which is often accompanied by uncontrollable hemorrhage. This has influenced the older operators and even some of the present day, though the numbers are getting constantly smaller to postpone operative intervention until after the death of the fetus. The placental circulation then becomes gradually obliterated and the risk of dangerous bleeding considerably lessened. The time when the placental circulation ceases seems to be subject to much variation, and some operators do not regard the operation as safe until several months have elapsed. The correctness of this view is borne out by the case of Horrocks, whose patient died two weeks after the death of the fetus from a profuse hemorrhage due to a sudden separation of the placenta from an unknown cause. McMurtry operated on a patient three weeks after the death of the fetus and his patient died on the table from hemorrhage. Delaying the operation until after the death of the child also invites the danger of sepsis of the sac, so that very little is gained for the mother by postponing the operation, while the child, of course, is sacrificed without even an attempt at its rescue. The living placenta should, therefore, be no contraindication to immediate operation, especially as more recent statistics, particularly by Dunning, have shown that even better operative results are obtained during the life of the child, and the child is certainly entitled to some consideration (Fig. 303).

In all cases the attempt should be made to extirpate the whole sac with the placenta, the technique being not unlike that practised in the removal of an intraligamentary tumor. As little handling of the placenta should be done during the operation as possible, and whenever practical, we should start out by securing both the ovarian and uterine artery. It is remarkable how the most frightful hemorrhage from the placenta can be promptly checked by this procedure, as has been demonstrated by the author's case, as well as that of Sippel. Unfortunately these arteries are not always within reach, as the anatomical landmarks are often completely wiped out and the location of the gestation sac renders it sometimes necessary to enucleate the portion of the tumor before access can be had to them. It is in such cases that a placental hemorrhage may terminate the life of the patient on the operating table, and all the coolness and skill of the surgeon is required to avert such a disastrous result. The sac should at once be filled with towels and firm pressure made against the placenta, or what is still better, compression of the aorta by the assistant while the operator rapidly finishes the enucleation of sac and placenta.

When extirpation of the sac is deemed impossible on account of very extensive adhesions, especially between placenta and coils of intestines, it should be stitched to the abdominal walls and drained, or if it can

be reached per vaginam, vaginal drainage may be substituted. These are always very unfortunate cases, and the results far from promising, as sepsis, venous thrombosis, and secondary hemorrhage from the placenta very often lead to a fatal result. Lusk very properly says that "the fortunate results belong to the domain of miracle and do not invite to imitation." In order to overcome the serious complications of this procedure several modifications have been attempted, especially that of closing the abdomen without drainage, expecting that the peritoneum would gradually bring about absorption of the placenta and sac, a result

FIG. 303

Ectopic gestation. Sac removed with living child at seven months.

not infrequent in cases of ectopic gestation left to nature in which everything disappears excepting the fetal bones. Braithwaite and Lawrence report successful cases treated in this manner, but others were unable to prevent sepsis from which the patients succumbed.

Whenever total extirpation is at all practical, even with resection of a portion of intestine, as was done by McDonald, it is unquestionably the best procedure and the one destined to give the best results; only in very exceptional cases should the sewing of the sac into the abdominal wound with drainage be resorted to.

CHAPTER XXVII.

ABNORMAL CONDITIONS OF THE URINARY TRACT IN WOMEN—SURGICAL CONDITIONS OF THE KIDNEY.

By J. WESLEY BOVÉE, M.D.

A KNOWLEDGE of abnormal conditions of the urinary tract in women is essential to the thorough understanding of the diseases peculiar to her sex. In the rapid strides taken by medical science during the past three decades the study of the urinary system has been taken up and carried along by the gynecologists so that practically the present status of our knowledge in that relation is due to gynecology. Nor can this condition of the matter be one of regret or envy, since the same branch of special medicine has placed at the shrine of Æsculapius the offering of perfected abdominal surgery. Its researches into congenitally abnormal and pathological conditions of the urinary system have been laborious and fruitful. While many conditions involving all the urinary organs and deserving our consideration might well be discussed in that relation, yet for convenience they will be considered like other conditions in connection with each organ separately.

THE KIDNEY.

It is not deemed advisable to consider the various forms of inflammation of these organs, the treatment of which is generally conceded to be purely medical in contradistinction to those deviations from the normal, requiring surgical intervention. For full consideration of those conditions the reader is referred to the various text-books, current magazine literature on internal medicine and various encyclopediac monographs on this special subject. A very thorough knowledge of them, however, as well as of urinalysis, is essential to the surgeon of any field. The shock and effects of general anæsthesia incident to surgical treatment of any portion of the body demand this familiarity.

The various conditions that will be considered are chronic nephritis, tuberculosis, calculus, pyonephrosis, pyelonephritis, perinephric extravasation, inflammation and abscess, hydronephrosis, injuries to the kidney, renal and suprarenal tumors, renal fistula, and misplacements of the kidney.

CHRONIC NEPHRITIS.

Chronic nephritis, long considered a purely non-surgical disease, has been brought to the border-line between medicine and surgery, thanks

to the brilliant work of Edebohls, of New York. It may be of the interstitial or fibroid variety or desquamative, the variety involving directly the mucous lining. The former is of especial interest, as it is this variety in which surgical relief has been attempted. Its causes are long-continued nitrogenous and alcoholic diets, sedentary and overtaxing mental occupation, arteriosclerosis, and probably uricacidæmia. The pathological changes are first passive congestion with increase of connective tissue diffused throughout the organ with subsequent contraction and consequent compression upon the uriniferous tubules and, perhaps, the glomeruli. The treatment devised by Edebohls is decapsulation down to the pelvis for the purpose of establishing collateral circulation. By this it is hoped to relieve the passive congestion. In 1901 Edebohls reported 16 cases on which he had operated with considerable success, and a goodly number of others have followed his plan with fair results. He offered this operation to victims of this disease that could probably live a month without it and could take a general anæsthetic.

Just what changes result have not been ascertained. According to the paper of Suker, presented at the meeting of the American Medical Association in 1903, Reginald Harrison attributes the results to the relief of tension. Edebohls and others add to the relief of tension the establishment of a more extended vascular formation with a greater anastomosis. Ries, Bernays and others do not place any weight on the new vascular formation. Zeit, of Chicago, says the kidney regenerates function quite rapidly if the tension is removed. Ries made sections of two kidneys and found no increased blood supply. Israel says concerning the mechanism of the operation that an inflamed tissue may be made to retrogress toward the point of health by splitting the affected structures. According to him, new venous anastomoses are formed between kidney and capsule. Tait, of San Francisco, on everting the kidney from the capsule in numerous rabbits, found a dense adherent fibrous mass surrounding the kidney within two months afterward.

As the disease may involve but one kidney or involve both to a different extent, examination of the excretion of these organs must be made separately. The urine segregator or ureteral catheter must be employed for this purpose. Not only the ordinary chemical and microscopic examination of the urine is necessary, but cryoscopy of the blood will be of great value in many cases to decide the advisability of the operation. This process consists of determining the freezing point of the blood. Van Hoffe and Raoult discovered that blood and other fluids freeze at a lower temperature in proportion to the quantities they contain of impurities dissolved in them. Koranyi, applying this law to blood, showed that normal blood possessed a freezing point of 0.56° C. below that of distilled water, which forms the zero of that thermometrical scale. From this point it does not vary more than 0.01°. Various German and French observers have found that, so long as the blood is healthy and its effete constituents adequately eliminated, it retains its normal freezing point, never varying more than 0.02°. But if the elimination becomes defective the freezing point sinks to —0.58° or even to —0.60°. Kümmell

found in 77 cases of renal insufficiency the freezing point of blood varied from —0.58° to —0.81°. The majority of cases show —0.60°. According to Kümmell, when the freezing point is —0.58° or —0.59°, renal sufficiency is incomplete but yet operation may be performed without too great danger. When the freezing point is lower than —0.59° severe surgical operations are not advisable. In 50 operations on the kidneys and ureters he determined the freezing point of the blood. In all these cases the correctness of the cryoscopic data was established by the results of operations. The conditions were hydronephrosis, pyonephrosis, and tuberculosis of the kidney. The apparatus of Beckmann for this purpose consists of a large test-tube set in a vessel containing ice and salt. Through a perforated cork placed in the mouth of the first tube a second and smaller test-tube is inserted, leaving an air space between the two tubes. The fluid to be frozen is put in the inner tube. A special thermometer with the Centigrade scale is employed for the purpose.

Suker says "decapsulation does not offer any hope in bilateral chronic nephritis with retinal complication." The most that can be said is that these cases are usually hopeless, that the operation, though still in the experimental stage, offers thus far better results than any other form of treatment.

RENAL TUBERCULOSIS.

Tuberculous involvement of the kidney may be either of the acute miliary variety or of the chronic caseous.

Frequency.—According to reports made at the German Congress of Surgeons, April 6–9, 1904, Kümmell found in 260 operations on the kidney done during the last fifteen years, 48 were for tuberculosis, and Krönlein found 30 per cent. of his kidney operations were for this disease.

Varieties.—Krönlein[1] distinguishes several forms of tuberculosis of the kidneys—the soft abscess variety, the firm, caseous, the diffuse firm, and the tuberous. Hunner[2] found every one of the 35 cases he studied showed the chronic caseous form of the disease and all grades of nephritis were seen, varying from the kidney with multiple small nodules or abscesses, with much of the kidney active, to the cases of pyonephrosis with complete destruction of the excretory substance. Several were smaller than normal and largely occupied by fibrous tissue. One kidney was converted into a multilocular cystic mass.

Etiology.—Krönlein, of Zurich, believes a great preponderance of the female sex does exist (75 per cent. of his cases), and is due to the effect of pregnancy and menstruation causing conditions which lower the resistance of the kidney tissue; Kümmell had 33 females of 48 cases (69 per cent.) of renal tuberculosis. Both Kümmell and Krönlein deny the possibility of an ascending tuberculosis of the kidney, regarding it as inevitably of hæmatogenic origin. Krönlein[3] found that but 12 of the

[1] Loc. cit.
[2] Transactions of the Southern Surgical and Gynecological Association, 1903.
[3] Loc. cit.

34 nephrectomized patients were free from tuberculous lesions elsewhere. In a tuberculous young man, who lifted a weight and complained of sudden pain in the back which grew steadily worse, he extirpated a kidney and found a solitary tuberculous focus, though he does not mention its precise location in the kidney. Autopsies on nine of the ten fatal subjects showed six to be free of tuberculosis in the remaining kidney. Hunner[1] found the average age of 35 cases in Kelly's clinic was thirty-two and one-half years, and the average duration of symptoms four and one-half years, making the average age at beginning of symptoms twenty-eight years. He doubts the probability of ascending tuberculosis, and expresses the opinion that the kidney is often the primary focus of tuberculosis in the female body.

Of whatever kind, it is produced by lodgement of the bacillus tuberculosis of Koch in the organ. It reaches the kidney through the circulation, the lymphatics, or by extension through the ureter from the lower urinary structures. The acute miliary form is most common in children, and is associated with like involvement of other organs, especially the lungs. As this form is not commonly amenable to radical surgical intervention, it will not be considered farther. The chronic or diffuse form, commonly termed caseous, is an affection of early life, rarely occurring before the age of five years and not usually after that of fifty-five years. Whether sex exerts any influence has led to considerable research without positive result.

Pathology.—The kidney may or may not be the only urinary organ involved. Dead as well as living bacilli may cause the process of caseation. It may occur simultaneously in the bladder. If the infection be by the blood, miliary tubercles are found in the cortex and the caseous nodules are larger at the base than at the apices of the pyramids.

Involvement of the pelvis is later. The ureter may not be involved. When ascending from the ureter, a rare condition, this organ shows the characteristic changes mentioned in consideration of that duct. The kidney is enlarged often to prodigious proportions, though in some Hunner found some smaller than normal and largely occupied by fibrous tissue. It contains areas of caseous material varying in size usually filled with pus containing debris with or without tubercle bacilli. They are surrounded by fibrous tissue in which the bacilli are plentiful at times. Whatever the mode of invasion, the lower urinary structures become involved. Rarely, however, calcification of the masses or dense fibroid changes about them may smother out the disease. The disease may lead to secondary foci in the spleen, liver, or other organ. Very commonly other infections are grafted on to the already grave lesions. The condition may be in one or both kidneys. Kümmell found it in both kidneys in 5 of his 48 cases. Of Krönlein's 34 nephrectomies, 10 died of tuberculosis in the other kidney or the lungs. Hunner says 90 per cent. of the reasonably early cases are one-sided, while 51 per cent. of the unoperated cases are found to have bilateral involvement.

[1] Loc. cit.

Symptomatology.—Very frequently no symptoms are noted. This is particularly noticeable early in the disease, but in marked cases prominent symptoms are present and vary according to the route of invasion. Pain is the most constant one, and if the infection is descending, is first noted in the region of the kidney. If the disease has travelled up the ureter the pain has first been noted in the hypogastrium or along the course of the ureter. Its intensity corresponds to the degree of involvement. Frequent or painful micturition are common symptoms and not modified by position. Early in the descending variety urinalysis affords no evidence other than polyuria. Later it may contain much debris consisting of pus, casts, and perhaps blood and tissue shreds. In the ascending variety the debris from the bladder and ureter may be noted even before the kidney is involved. Tubercle bacilli may or may not be present. Fever is usually present from the beginning and the hectic flush is practically as constant as when the lung is involved. Septic chills are not uncommon; night sweats are noted in advanced cases and acceleration of the pulse rate is usual, and in advanced stages marked. These with emaciation practically make up the symptomatology.

Diagnosis.—The diagnosis is based upon (1) a careful history study; (2) physical examination of the kidney and ureter; (3) careful urinalysis; (4) the tuberculin test; and (5) inoculation of animals. The age of the patient, the symptoms mentioned, and later in the disease the presence of a mass in the region of one or each kidney, and particularly if connected to the bladder by a large and hard cord-like mass, warrant suspicion of tuberculosis of the kidney, and perhaps the ureter. Finding the material in the urine mentioned, and especially if tubercle bacilli are found, the diagnosis should be accepted. If the tuberculin test be applied to the patient or animals inoculated from the urine, with positive results, then the diagnosis is absolutely positive. Renal crises due to blocking of the ureter from debris or blood may be mistaken for those due to ureteral calculi or other forms of arterial obstruction.

Prognosis.—The prognosis depends upon the degree of involvement of the urinary tract. The extent of involvement of other organs, as the lungs, peritoneum, bladder, and pleura, the general condition of the patient, and, in early cases, whether climatic treatment is possible. If the last be practicable then the outcome is reasonably hopeful. This is especially true if the general condition is good. If other structures or both kidneys are involved the prospect is gloomy. If the ureters and bladder are much involved the prognosis is very grave; 24 of Krönlein's 34 nephrectomy cases are well after intervals up to fourteen years.

Treatment.—In early cases climatic treatment cannot be too strongly recommended, provided the condition of other organs justifies it. Fresh air, warm clothing, and highly nutritious food are indicated. Little time should be used for climatic treatment, as the results of early nephrectomy are so good. Of Kümmell's 43 cases, 32 are living after intervals up to fifteen years. Krönlein operated 34 times, 8 dying during the first month and 2 of recurrence after six and ten years, respectively. Hunner reports 29 nephrectomies, nephroureterectomies and nephrouretero-

cystectomies with 3 deaths. These operations were for late as well as early cases, giving a larger mortality than if all had been done early. In more-advanced stages nephrectomy is to be done when but one kidney is involved. If both be markedly involved possibly nephrotomy on one or both sides may be advisable. Cryoscopy of the blood should be practised before concluding.

RENAL CALCULUS.

Renal calculi are composed of renal deposits of precipitated urinary solids and mucus or other albuminoid substance that acts as a cement. Some writers claim the presence of this material is a *sine qua non* to the formation of urinary calculi. They are found singly and in large numbers and having sizes varying as widely. Their elective sites are the uriniferous tubules and in the calices. Various authorities have divided them into two classes—primary and secondary. Primary calculi are formed independently of the condition of the kidney and are formed from uric acid, urates of ammonia, and soda, oxalate of lime, basic phosphate of lime, carbonate of lime, cystine or cystic oxide and xanthine, or uric oxide. Primary calculi are usually composed of but one ingredient of the urine, though two or more in layers are frequently noticed. Occasionally a blood clot is found to be the nucleus. When but one ingredient is present in the calculus it is practically never xanthine, but one of the others mentioned. When the urine is deficient in sodium

FIG. 304

Type of dendritic calculi.

FIG. 305

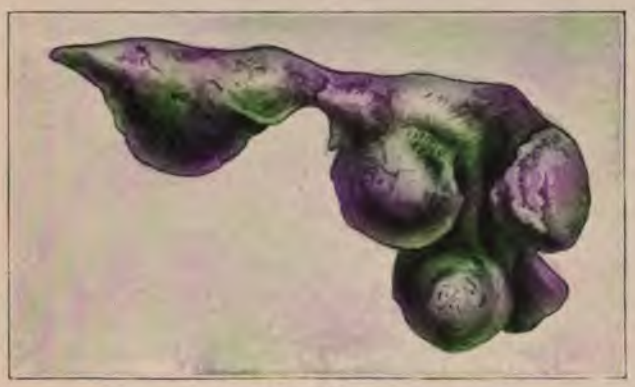
Type of dendritic calculi.

chloride and the alkaline phosphates uric acid and urates are prone to be precipitated. When the urine is of alkaline reaction from fixed

alkali the lime salts are likewise prone to precipitation. The most common forms of renal calculi are uric acid or urates. Oxalate of lime is probably the next most frequent form.

Secondary calculi are generally formed after inflammation or infection has been excited from the presence of a primary calculus or other cause.

FIG. 306



Type of dendritic calculi.

When from an existing calculus they may be mixed in composition by the deposit of lime salts about the primary one. They are commonly composed of ammoniomagnesian phosphate, phosphate of ammonia, or phosphate of lime, or some combination of these salts. These are usually

FIG. 307

Type of dendritic calculi.

deposited from urine rendered alkaline by the presence of carbonate of ammonia, a product of decomposed urea. According to Taylor, quoted by Henry Morris, urate of ammonia is the nucleus of renal calculi in infants, in young life uric acid and after the fortieth year it is oxalate of lime.

FIG. 308

Section of kidney showing a stone lying in a calyx.

FIG. 309

Kidney atrophied from an obstructive calculus: a, location of calculus.

FIG. 310

Section of kidney showing obstructing calculus and beginning hydronephrosis.

In shape renal calculi vary remarkably. They may be cylindroid, globular, flat, or they may be casts of the pelvis and calices of the kidney. They may be quite smooth or roughened to an unusual degree. The uric acid calculus is very hard and the oxalate of limestone is unusually dense and roughened. Phosphatic calculi are very friable.

One or both kidneys may be involved, many cases of bilateral nephrotomy for calculi in both kidneys being recorded. Calculi may be again formed in a kidney after successful nephrolithotomy. Morris says in about 10 per cent. of his cases he has had to repeat the operation once or twice.

Symptoms.—Sometimes no symptoms are present. Very small calculi may be formed, dislodged and passed out through the urinary tract without symptoms. And, again, a fair-sized calculus may remain in the kidney for years without having symptoms. Again, the symptoms may be such as to refer entirely to some other organ. It is not uncommon for the symptoms of renal calculus to be referred to the ovary, bladder, uterus, ureter, and even the urethra. Vesical irritation in women has frequently been the only symptom of renal calculus. Morris mentions a case in which nephrolithotomy promptly cured the individual in which the bladder symptoms had caused a vesicovaginal fistula to be maintained for ten years. The expert in renal surgery very often in the same manner relieves long-standing uterine pain. The evidence of pus accumulation, which is liable to result from the presence of calculi in the kidney, may furnish the only symptomatology.

The usual symptoms are pain, blood, or albumin in the urine or irritability of the bladder. The pain is usually in the lumbar region, but may be nearer the umbilicus or even in the groin, and is increased by motion. Mobility of the kidney may in many cases account for the abdominal or inguinal pain. Blood appears in the urine irregularly, though in marked cases it may be constantly present. Pus is present practically all the time in old cases. Contrary to this I will mention one case in which nephrotomy and later nephroureterectomy was done for calculus pyonephrosis and multiple abscesses in the ureter, in which in several urinalyses made shortly before nephrotomy no pus was found in the urine. Nor was albumin or blood present. Renal crises are common and may occur at any time in the progress of the disease. They are due to a calculus or other foreign substance blocking the ureter and causing a column of urine to be formed behind it, which, together with the vermicular action of the ureter, attempts to expel it. Early in the condition no lumbar tumor is present, as a rule, but later, especially when pus has formed, it is to be expected. Gastrointestinal symptoms, as in movable kidney, are prominent in some cases.

Diagnosis.—This is based upon the symptoms mentioned when unaccompanied by evidence of tuberculosis or malignancy. Urinalysis may occasionally reveal the presence of minute particles of calculus material in the urine. The *x*-ray pictures or screens may point to the presence of calculi, but implicitly cannot be relied upon with the degree of skill with which it is at present employed. The calculi formed of

uric acid and other organic matters seem to escape detection by this method of examination.

Prognosis.—This depends upon the complications, as uncomplicated renal calculus may be relieved by surgical intervention with but slight mortality. Whenever suppuration results the life of the individual is endangered. The mortality rates of nephrotomy and nephrectomy have steadily declined, though patients suffering from this condition frequently ask for surgical assistance only when it is much exaggerated. If not treated a fatal termination is to be expected.

Treatment.—The treatment of renal calculus is dietary when small fragments are passed. If sufficient evidence is at hand to support a

FIG. 311

Resistance of renal calculus to passage of x-rays. *A*, skiagraph from four minutes' exposure; *B*, exposure of eighteen minutes.

diagnosis of stone in the kidney, then, *cæteris paribus*, nephrolithotomy is indicated. If pus be present arrangement for free-loin drainage should be made. If a very considerable destruction of the kidney structure has resulted from the suppuration, then nephrectomy may be considered. Unless a careful study of the urine from the other kidney and a physical examination of it demonstrate a probability of its capacity to perform the function of urinary excretion alone and the general condition of the patient is fair, it should not be done.

PYONEPHROSIS.

This condition, characterized by one or more accumulations of pus in the kidney, may be due to various causes. Infection may be carried to kidneys through the blood or lymphatics or by the ureteral mucosa. It is not uncommon in conjunction with septicæmia or pyæmia. It may result from injury, from ureteral obstruction acting conjointly with infectious pyelitis or nephritis or through wounds connecting with the surface of the body. As the colon bacillus is frequently found in the kidney, it may be an active causative agent. Foreign bodies, as calculi located in the kidney, may be exciting causes, though by no means invariably so. Infection of renal cysts may likewise be a means of creating pus accumulations in the organ. Ascending gonorrhœa is probably a much more frequent cause than was formerly supposed. Numerous cases have been reported that could reasonably be considered as such. I have quite decisively traced three cases to that cause.

Sowers, of Washington, has reported a case treated by him in which urethral gonorrhœa was followed by ascending infection to the kidney, pyonephrosis and burrowing of the pus to the bronchus with recovery.

The relation of tuberculosis to pyonephrosis is considered in the article on Renal Tuberculosis.

Symptomatology.—The early symptoms vary with the intensity of the onset, which, of course, depends upon the etiological factor. If of secondary character or concurrent with some other malady, the symptoms of the attack may escape notice for some time. In one case seen fourteen days after labor with Dr. Roman, of Washington, D. C., he had fortunately detected a fever of 100° to 103° before and during an easy parturition. This continued, and I noticed the presence of a lumbar enlargement. Urinalysis showed marked pyuria, and puerperal sepsis was excluded. Nephrotomy and subsequently successful nephrectomy and partial ureterectomy were done for multiple calculus pus pockets in the kidney, hypernephroma, pyoureter, and ureteral calculus lodged at the iliac crossing. Usually there are lumbar pains accompanied by irregular fever, perhaps one or more chills at irregular intervals and the presence of a tumor in the lumbar region. The enlargement usually depends upon the amount of pus present, though the existence of a tumor of the kidney or of the suprarenal capsule, calculi, or tuberculosis, or even hydronephrosis may negative to some extent this feature. The urine may or may not contain pus. The quantity of urine may or may not be decreased, depending largely upon the amount of involvement of the functionating portion of the kidney structure on both sides. Tension of the abdominal wall on the affected side will be noted in acute cases but is usually not present in chronic conditions.

Diagnosis.—This is based upon the septic temperature chart, the presence of pain, and a mass in the region of the kidney, pyuria, and nothing else to account for the condition. If to these a history of calculus, tuberculosis, or other exciting cause be obtainable, then the diagnosis is practically certain.

Treatment.—This consists of surgical intervention depending upon the nature of the process. If from calculi or tuberculosis, the most radical surgery may be contemplated. If from some other causes, flushing of the kidney by means of the ureteral catheter may be employed. If pus pockets are present, complete relief by this method is not to be expected. Bozeman, in 1888, was probably the first to employ this treatment, though the attention of the profession at large was drawn to it by the brilliant work of Kelly. Should it fail resort may be had to more radical procedures. These are nephrotomy or nephrectomy. If the condition be due to any cause whatever in severe cases, nothing more is advisable than nephrotomy and drainage through the loin. This permits relief to the eliminative organs and the general condition of the individual to greatly improve. This does not always prove sufficient. Multiple renal abscess and blocked ureter may cause a permanent loin fistula and septic absorption may continue nearly as badly. In such conditions nephrectomy should not be delayed until

the improvement due to nephrotomy has been negatived. If the remaining kidney is already crippled or absent a second nephrotomy, with removal of ureteral obstruction, if present, should be preferred.

PYELONEPHRITIS.

This is an inflammation of the renal pelvis and of the kidney itself. It is usually antedated by an inflammation, infection occurring by one of the routes previously mentioned. It may or may not be suppurative. The organ is not so much enlarged as in pyonephrosis. The exfoliation of pelvic epithelium is markedly noticeable, as well as the presence of pus in the urine in suppuration. There is usually less pain and less fever than in pyonephrosis.

Treatment.—The treatment consists of flushing the organs by the administration of large quantities of alkaline waters, and such urinary sedatives and antiseptics as buchu, hyoscyamus, the potash salts, and urotropin, etc., with perfect rest in bed are indicated. The diet should be free from stimulants and contain the least possible amount of nitrogenous food. Colonic infusion of a quart of salt solution at a temperature of 115° to 120°, two or three times daily, is usually beneficial. Rarely will flushing by means of the ureteral catheter be required. If no pockets of pus form the result is usually favorable provided marked changes in the kidney are not present.

PERINEPHRIC INFLAMMATION, EXTRAVASATION, AND ABSCESS.

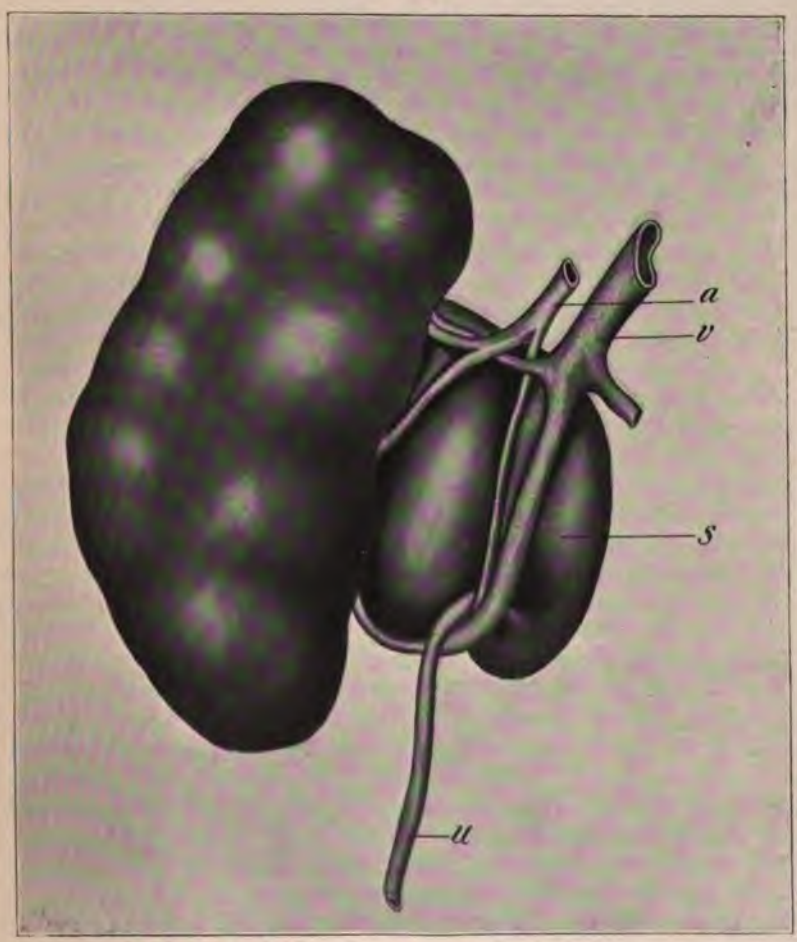
Perinephric inflammation, extravasation, and abscess may be considered together conveniently, inasmuch as their causes are very much alike and the pathological process very similar, abscess frequently following the other two. Inflammation of the perinephric structures may result from injury, leakage from a pathological kidney or ureter, vermiform appendix, uterus, broad ligaments, or even vagina. Extravasation follows rapidly, and owing to the preponderance of adipose-tissue suppuration is prone to be but little delayed. Occasionally rupture of a renal abscess, with perhaps the extrusion of a calculus, causes a large perinephric abscess within a short time after special symptoms are noted. The same may be said of those that are traceable to postpartal or postabortion infection. The largest I ever saw originated in this way and had escaped detection of a careful clinician until it was pointed out at a consultation. In these conditions the mass appears rapidly and may appear independent of any renal lesion. The urine is usually practically normal. If suppuration does not occur the mass may rapidly disappear under appropriate treatment, which consists of topical applications of the ice-bag or hot fomentations, together with general remedies. Should suppuration occur a loin incision with free drainage is necessary, and if the pus collection extend low toward the

pelvis a counteropening in the iliac region may be of advantage. In the puerperal case mentioned a third opening into the vagina was found necessary. Great care should be exercised that the kidney or ureter be not injured if not involved in the condition.

HYDRONEPHROSIS.

This condition, also known as nephrectasis, is characterized by distention of the pelvis of the kidney and its radices by urine. It may be

FIG. 312



Hydronephrosis caused by the compression of ureter by the renal vessels : *a*, renal artery ; *v*, renal vein ; *s*, distended pelvis ; *u*, ureter.

present in one or both sides and may be permanent or intermittent. The site of the obstruction may be along the course of the ureter, the

bladder, or even the urethra. When in the ureter the resulting hydronephrosis is on that side only, although a like or different condition of the fellow duct may cause hydronephrosis of the corresponding side. If the obstruction in the bladder be from a tumor or other cause situated near one ureteral opening perhaps but one ureter will be involved. If in the urethra, the nephrostasis will be bilateral. Of course, if one kidney be absent or silent as to function these statements necessarily would not hold. In not a few cases the obstruction is not due to any pathological condition of the urinary organs, but to abnormality in some adjacent structure. In not a few cases have I seen it complicating carcinoma of the cervix uteri and broad ligament. Tumors of the uterus, ovaries, Fallopian tubes, intestine (particularly of the cæcum or sigmoid), or any abdominal organ may so compress the ureter or other portion of the urinary tract as to obstruct the flow of urine. Intermittent hydronephrosis results when the cause is not continuous. This is well instanced in the movable or floating kidney with a kink or acute angulation of the ureter. Should the obstruction be complete for a period beyond six weeks' experimentation shows that it will permanently abolish the kidney function.

Symptoms.—The symptoms vary according to the cause and degree of obstruction. Should it be of the intermittent type the well-marked renal crisis occurs accompanied by decreased amount of urine and sudden development of a renal tumor. Great pain and prostration, with perhaps vomiting, occur. Very suddenly the pain markedly lessens, the renal tumor disappears, and the patient expels a large quantity of pale urine. The other symptoms cease and the patient feels perfectly comfortable. The distention may occur so very slowly that no renal crisis is experienced. In fact the presence of a renal tumor is accidentally noticed by the patient or physician, no symptoms having been noted. The urine in chronic hydronephrosis is practically always of low specific gravity and very pale. Back pressure against the uriniferous tubules, lessening their function, seems to precede the same effect upon the glomeruli.

Diagnosis.—In the intermittent variety this is based upon the history of renal crisis, perhaps frequently repeated, the presence of an elastic renal tumor, a decreased amount of urine in the attack, absence of fever, the sudden relief from symptoms with increased quantity of urine in the bladder having a low specific gravity. In the chronic form it is based upon the tumor mentioned, the lower specific gravity of urine from the involved side as secured by getting the urine separate, the absence of pus or other pathological material in the urine, and, perhaps, the discovery of a cause for the obstruction.

Treatment.—From the foregoing it will be evident that complete cure depends on removing permanently the cause of obstruction. Nephrorrhaphy, a Küster or Fenger operation for ureteral valve-like constriction, the removal of a vesical tumor, or whatever is indicated must be done. In renal crisis hypodermic injection of morphine will promptly relieve pain, and manipulation of the mass with change of position of the patient

may remove the obstruction and the consequent distention. This is less apt to occur if a calculus be the cause. In rare cases aspiration may be needed and still more rarely nephrectomy or nephrotomy may be required. Aspiration and nephrotomy are not *per se* of permanent benefit, but will accompany measures aimed at the exciting cause.

INJURIES TO THE KIDNEY.

These may vary in degree from the very slightest to complete destruction of one or both of these organs. Their position, particularly the left, is one so protected that they often escape when adjacent organs are severely injured. They are subject to gunshot wounds as are other organs of similar size. They are usually injured by falling a long distance, crushing in railroad accidents, the passing of wheels of heavy vehicles over the body, and other forms of marked violence. They may be so severely injured as to entirely destroy their function. Severe hemorrhage, urinary extravasation or ureteral obstruction by coagulated blood may demand proper surgical intervention. It is believed slight injuries are often recovered from by rest in bed and careful supervision. If the injury call for surgical relief it will vary from suturing, or resection, or simple drainage up to nephrectomy. This should never be done to a functionating kidney unless the indication be absolute.

RENAL AND SUPRARENAL TUMORS.

New-growths of these organs vary much in size and consistency. Of 157 cases collected by Henry Morris from literature, 63 were sarcomata, 45 carcinomata, 21 cystic degeneration, 11 hydatid cysts, 10 adenomata, 3 papillomata, 2 myxomata, 2 lipomata, and 1 dermoid cyst. In the other 5 cases the tumor was in 1 due to a collection of cholesterin, 1 was of doubtful nature, and 3 were tumors of the suprarenal body. It will be noticed that practically 131 of them were of a malignant nature. New-growths of these organs, therefore, from their nature should be early discovered and at once removed if eradication would be made. Unfortunately lymphatic involvement is rapid and it is but a step to structures that cannot safely be removed.

Symptoms.—The principal symptoms are pain, hæmaturia, and the presence of a tumor in the location of the kidney. Later in the history comes, in most cases, urinary changes. Usually these symptoms are not noticed until the disease has spread to the lung or liver and frequently the tumor is secondary, and, therefore, symptoms referable to other organs precede those directly relating to the kidney involvement. If the tumor springs from the capsule or the medullary portion hæmaturia may not be noticed until late.

Diagnosis.—This is not simple, as it has to be differentiated from liver, splenic and lymphatic gland enlargements, tumors of the intestine, ovary,

the abdominal walls and uterus, appendicitis, fecal accumulation, etc. With either of those conditions specific symptoms are usually present without special renal and urinary symptoms. It should be remembered

FIG. 313

Simple papilloma of kidney.

FIG. 314

Malignant papilloma of kidney.

that the colon lies in front of the kidney, that the kidney tumor is practically always rounded though not necessarily retaining the characteristic kidney shape. Should bloody urine be found coming from either or both apparently normal ureters and a tumor be found in the region of one or both kidneys, then, exclusive of injury, tumor of the kidney is the logical conclusion. Hypernephroma or adrenal tumor grows into the kidney and may give the usual kidney symptoms.

Treatment.—The treatment consists of early eradication, as the percentage of successful eradication is very small and other treatment valueless. Cystotomy may be called for rarely in renal cysts as a temporizing agent only.

RENAL FISTULA.

This condition is characterized by an abnormal track from the kidney to some place of outlet, usually the skin, through which passes urine or some pathological product. It may rarely arise from a renal abscess burrowing to the surface. The treatment by the surgeon is now earlier invoked than formerly, and such cause is not so frequently seen as in time past. A calculus may corrode the tissues and escape through the skin, leaving a fistula. Injuries, especially punctured, incised and gunshot wounds are frequent causes. It most frequently follows surgical operations on the kidney.

If obstruction to the flow along the urinary passage be absent, such fistula closes in a short time—a few weeks—unless it connect with some portion of the kidney not completely drained by the ureter. If obstruction exist, then the fistula will continue almost indefinitely.

Treatment.—This consists of first making sure of a normal kidney drainage, and if after a few months the prospects of a spontaneous cure are not good then an exploratory incision should be made along the fistula with a probe as a guide. If normal urine is escaping from the fistula it should be diverted to the ureter preferably by kidney incision and suturing. If pus be the discharge, then search for an abscess or calculus must be made. If a calculus be found it should be removed and nearly always drainage employed, the exception being when the normal course seems ample. If an abscess be found it should be cleaned and freely drained through the loin. If from tuberculosis it must be treated according to indications. Closure of the fistula is usually prompt.

MISPLACEMENT OF THE KIDNEY.

The dislocation of a kidney may be fixed or permanent or it may be intermittent or temporary. Of the former variety the horseshoe kidney is the most common. Other notable varieties of misplacements are opposite the sacroiliac synchondrosis over the promontory of the sacrum, in the false pelvis, or across the common iliac vessels. These fixed or

congenital misplacements are very rarely of one kidney alone. This remark is unnecessary regarding the fused or horseshoe variety. In this form the two organs are joined by a mass of tissue having various lengths and transverse diameters, as well as varying from renal structure to mere fibrous tissue. In a case I recently explored through a left ilioinguinal incision the isthmus of connecting renal tissue was two inches in width and one inch in thickness spread across the aorta just at its bifurcation. The two kidneys were placed with the middle convex borders toward the anterior superior spinous processes of the respective sides.

Causes.—The movable or the floating kidney may be either congenital or acquired, but is usually acquired. The organ has a normal vertical mobility of about one and one-half inches. Floating kidney is very rare as compared to the frequency of movable kidney. It may have a mesonephron, in which case the condition is congenital. This is not usual, however. It usually is merely a kidney having exaggerated mobility and a lax peritoneum in front of it. Either the movable or the floating kidney may descend into the pelvis complicating parturition or causing dysmenorrhœa by pressure against the corresponding tube and ovary. Edebohls has quite clearly demonstrated that on the right side it is a predisposing cause of appendicitis.

The acquired variety is usually due to absorption of a considerable amount of the bed of adipose tissue upon which the organ rests. Lifting heavy weights or other marked strain upon the abdominal walls with distended lungs and a fixed diaphragm; falling or jumping from heights; even moderate and tight lacing of corsets, so as to constrict the upper portion only of the abdomen, are among the principal causes.

Symptoms.—The symptoms are variable. They usually are referable to the organs pressed against by the misplaced kidney, such as the intestinal tract or the pelvic organs in women. Should it reach the brim of the pelvis it may cause pains and other vague symptoms in the leg from pressure upon the iliac veins or the lumbar nerve trunks. It may, if brought in contact with the uterus and appendages, give rise to symptoms relative to those organs. If it cause a kink or angulation of a ureter renal crises may be present or it may produce pain along the whole lower portion of the urinary tract. Should both kidneys be misplaced these symptoms are apt to be bilateral. In women, particularly those of a nervous temperament, a high state of nervousness is usually present. In one of my patients who refuses operation the symptoms are a sense of dragging in the lower abdomen and occasionally a short attack of severe pain probably due to temporary compression of the kidneys. In this case both kidneys reach the false pelvis, and in her four pregnancies and labors have caused a marked degree of pain. In many cases there is a general ptosis of the abdominal viscera.

Diagnosis.—This is based upon the history of the case, the presence of a tumor, having the size and shape of a kidney, on one or both sides of the abdominal cavity below the ribs, and the absence of the kidney in its normal position. In the horseshoe kidney the tumor is not easy

to detect except in very thin subjects. It is fixed. In the movable or floating kidney it may and, indeed, is apt to be in its normal position with the patient lying supine, and particularly if the head be lower than the hips. If the chest be slightly elevated and the patient be requested to inhale vigorously the kidney is displaced and can be readily felt upon emptying the lungs.

Treatment.—In a large proportion of cases a well-fitting bandage will suffice to keep the organ in the normal position, and if in thin subjects a line of treatment for increasing weight be employed oftentimes a sufficient amount of fat is deposited in the fatty capsule about the kidney to form a satisfactory support to the organ. In some it would seem the support from the bandage retains the kidney for a sufficient amount of time for it to acquire a habit of remaining *in situ* after removing the bandage. In many cases such treatment will not suffice and the kidney has to be sutured to the wall of the abdomen well up against the ribs. This may be done by nephrorrhaphy or nephropexy.

OPERATIONS ON THE KIDNEY.

Incision.—As all cutting operations on the kidney, exploratory or otherwise, are, as a rule, best made extraperitoneally, I will mention first the kind of incision that best meets all requirements as to exposure of this organ. It is one beginning very close to the twelfth rib near the attachment to it of the erector spinæ muscle and extending in a nearly straight line toward the anterior superior spinous process of the ilium. Its length will depend upon the thickness of the abdominal wall in that region, the nature of the kidney operation proposed, and the size of the mass to be removed if nephrectomy is planned. This incision may be carried anteriorly half an inch, from the costal border or downward, curving slightly forward. Some rapid surgical operators prefer a transverse incision beginning at the anterolateral border of the erector spinæ muscle about one inch below the twelfth rib and extending toward the median line as far as desired. Great caution is necessary, especially in cases in which infection of the kidney is known to be present to avoid opening the peritoneal cavity. Extremely rarely will the transperitoneal route to the kidney be employed for obvious reasons. The lateroprone position of the body of the patient placed upon a pillow or Edebohls' inflatable rubber bag materially assists in bringing the kidney into the loin wound.

Just before the kidney is reached the beautiful canary-yellow fatty kidney capsule is noticed and incision of this exposes the kidney substance itself.

Nephrotomy for pus, calculi, or other purpose may now be done, the pelvis and ureter explored either transrenally or otherwise, or even the organ removed—nephrectomy. If the kidney has been incised the opening should be closed by a few rows of continuous suturing with catgut or kangaroo tendon if no infection be present. Otherwise no sutures should be used. The wound in the abdominal wall should be

closed without drainage only when no leaking kidney wound or infection or large space between the fascia and the peritoneum are present. It is interesting to note that the first deliberately planned nephrolithotomy was done by Dawson, of Cincinnati, in 1873, and the first nephrectomy

FIG. 315

Line of incision for retroperitoneal exploration of kidney and ureter by the lumboilioinguinal route.

by Wolcott, of Milwaukee, in 1861. Wolcott's case died fifteen days later from infection, as did Simon's second case in 1871.

Nephrorrhaphy for misplaced kidney was devised by Hahn and first performed by him in 1881.

CHAPTER XXVIII.

SURGICAL CONDITIONS OF THE URETER.

By J. WESLEY BOVÉE, M.D.

THE principal conditions of the ureter to be considered are anomalies of development, inflammation, strictures, kinks, or valve-like constrictions, tuberculosis, tumors, calculi, calculous anuria, injuries, and operations performed on them.

ANOMALIES OF DEVELOPMENT.

These principally consist of duplication in part or in whole. The most common variety of duplication is two ureters leaving one kidney independently, each draining a part of that organ and at some place before reaching the bladder joining and making but one lower ureter. Less common is a bifurcation of a ureter in its lower half and both branches emptying separately into the bladder. Still less common is double complete ureters on one or both sides, emptying into the bladder separately. A rare anomaly is that of one ureter discharging abnormally into the urethra or vagina or on the vulva. These anomalies of themselves are harmless except the last mentioned. In this variety constant dribbling of urine is very disagreeable and may permit ascending infection. Davenport and Baker, of Boston, Colzi, Baumm and others have successfully done operations for grafting the fugitive ureter into the bladder. In the other classes a knowledge of their existence may be of advantage in repairing complete section of the duct. This particularly applies to bifurcated ureter, as the whole kidney is drained by one, and, moreover, most injuries of these ducts requiring disposal of the urine by operation occur in the lower half. In cystoscopy finding two ureteral orifices on one side of the bladder is confusing. In tuberculosis or malignant disease the possibility of the existence of a second ureter should be borne in mind and removed as well as the first.

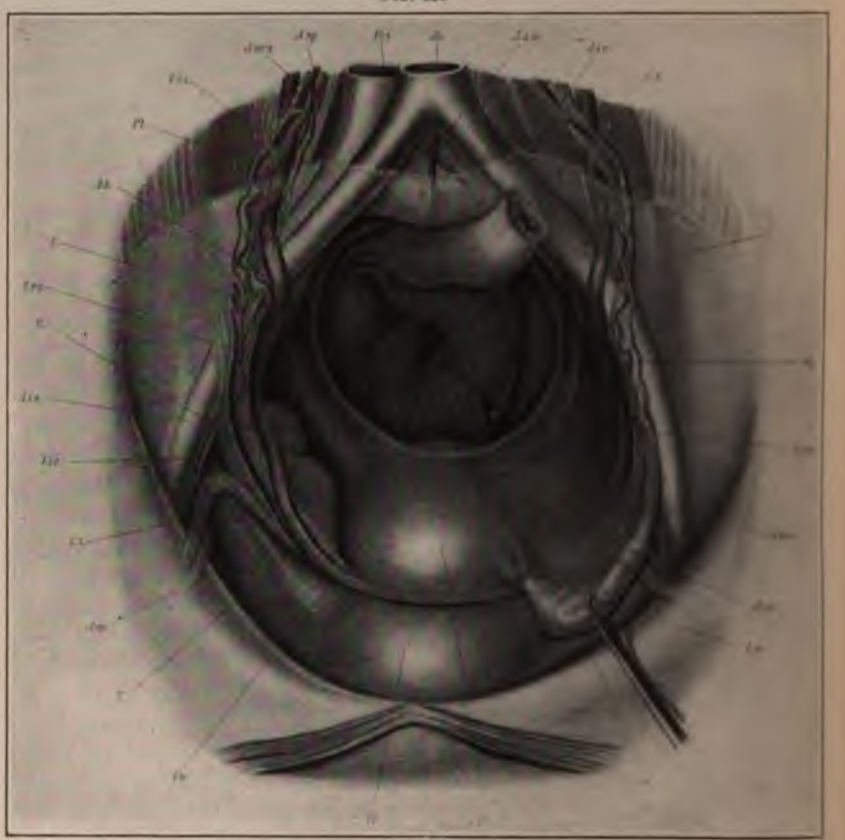
URETERITIS.

Inflammation of the ureter may arise from gonococci, colon bacilli, staphylococci, and various other pathogenic bacteria. It is usually by extension from the kidney or the bladder, though it is possible for it to reach the duct from surrounding tissues. Small calculi passing along it may excite inflammation. If lodged they not only excite inflam-

mation but pressure necrosis sufficient for perforation. Rarely ureteritis may spread from the exit of an abnormal ureteral opening.

Symptoms.—The symptoms of mild ureteritis are slight pain and tenderness along the duct with or without appreciable enlargement of it. There is apt to be frequent micturition, though this is much more

FIG. 316



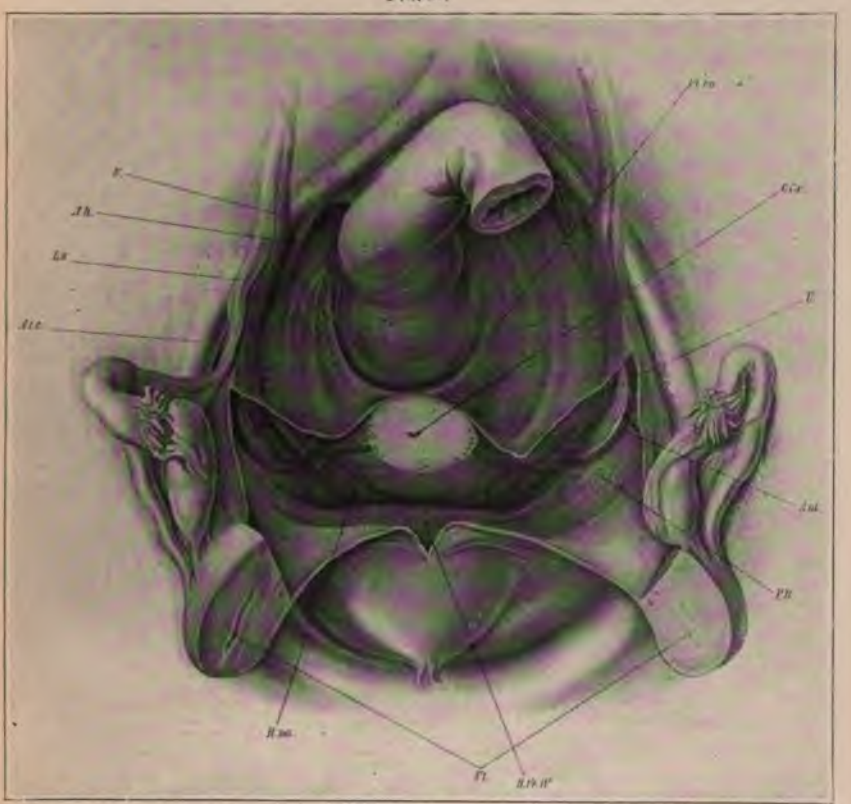
Relation of ureters to the spermatic plexuses, etc.: *A. ep.*, epigastric artery; *A. h.*, hypogastric artery; *A. i. c.*, common iliac artery; *A. i. e.*, external iliac artery; *Ao.*, aorta; *A. s. m.*, median sacral artery; *A. sp.*, internal spermatic or ovarian artery; *A. ur. i.*, inferior ureteral artery; *A. ur. s.*, superior ureteral artery; *A. ut.*, uterine artery; *C. s.*, sigmoid colon; *L. o.*, ovarian ligament; *L. r. u.*, rectouterine ligament; *L. t.*, round ligament; *O.*, ovary; *Pl.*, ovarian plexus; *Pu.*, portio vaginalis; *T.*, Fallopian tube; *U.*, ureter; *Ut.*, uterus; *V. c. i.*, inferior vena cava; *Vs.*, urinary bladder; *V. i. c.*, common iliac vein; *V. i. e.*, external iliac vein. (From Tandler u. Haiban, Topog. d. Weiblichen Ureters, Wien u. Leipzig, 1901.)

common when the kidney or bladder is involved, and particularly if the lower end of the ureter is involved. When the bladder is principally involved and the disease has ascended along the ureter then marked pain extending along it from the bladder may be expected. Apparently the inflammation is most severe about the points of smallest calibre.

One of these being just above the iliac crossing that will be found to be a tender or painful point. If the inflammation be descending from the kidney, polyuria is very common and pus is found in the urine in considerable quantities, though not so marked in mild ureteritis. The ureter may be blocked permanently or intermittently, preventing the escape of urine and pus.

Diagnosis.—This is based largely upon the regional tenderness or pain, appreciable enlargement of the ureter, frequent micturition, and perhaps

FIG. 317



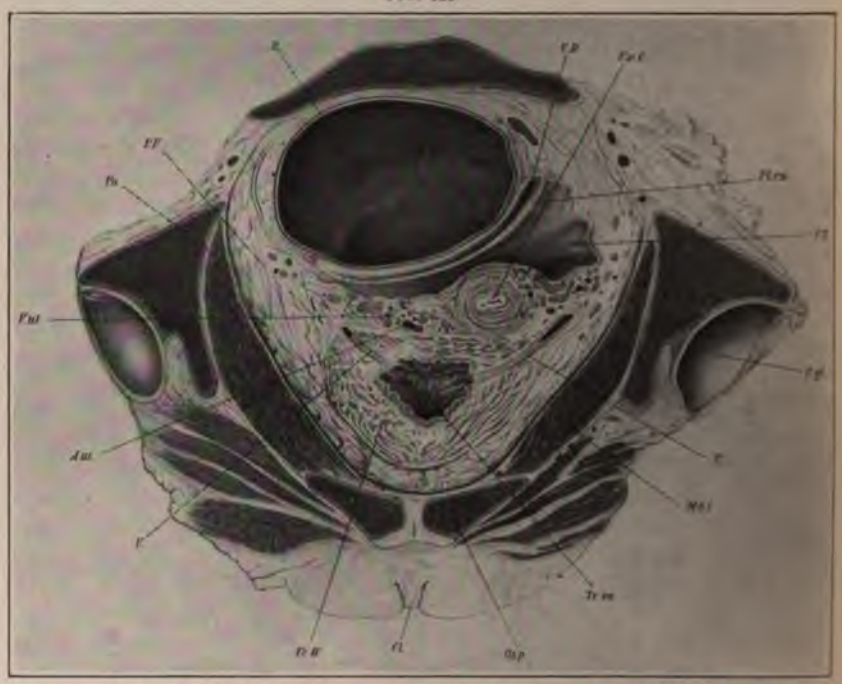
Relation of the ureters to the uterine artery and the cervix uteri ; *A. h.*, hypogastric artery ; *A. i. e.*, external iliac artery ; *A. ut.*, uterine artery ; *C. cz.*, cervical canal ; *H. Ve. W.*, posterior wall of bladder; *L. S.*, suspensory ligament; *P. B*, pelvic fascia; *Pl. r. u.*, rectouterine fold ; *R. va.*, vaginal ramus ; *U.*, ureter, *Ut.*, uterus. (Tandler u. Halban.)

polyuria and pyuria. If previous evidence of bladder or kidney disease has been available ureteral extension will be promptly recognized by the few local symptoms added at the time. Ureteral catheterization will be apt to produce a greater amount of blood in the urine than usual and more pain.

Treatment.—Ascending ureteritis usually can be prevented by proper treatment of the bladder, and aseptic detail in handling any necessary

instruments in the lower urinary passages. When the disease has arisen it should be combated by rest in bed, counterirritation, the administration of alkaline diuretics with enormous quantities of alkaline or distilled and sterile water. The bladder should be frequently emptied. This may be accomplished best in rare cases by catheterization or the catheter *en demeure* in the bladder. It is extremely important that renal and vesical complications be vigorously treated. But little advantage would be gained in treating ureteritis alone if the principal disease were in the kidney or bladder. Nephrotomy, nephrolithotomy, or even nephrectomy may be required, and after the original cause has thus been

FIG. 318



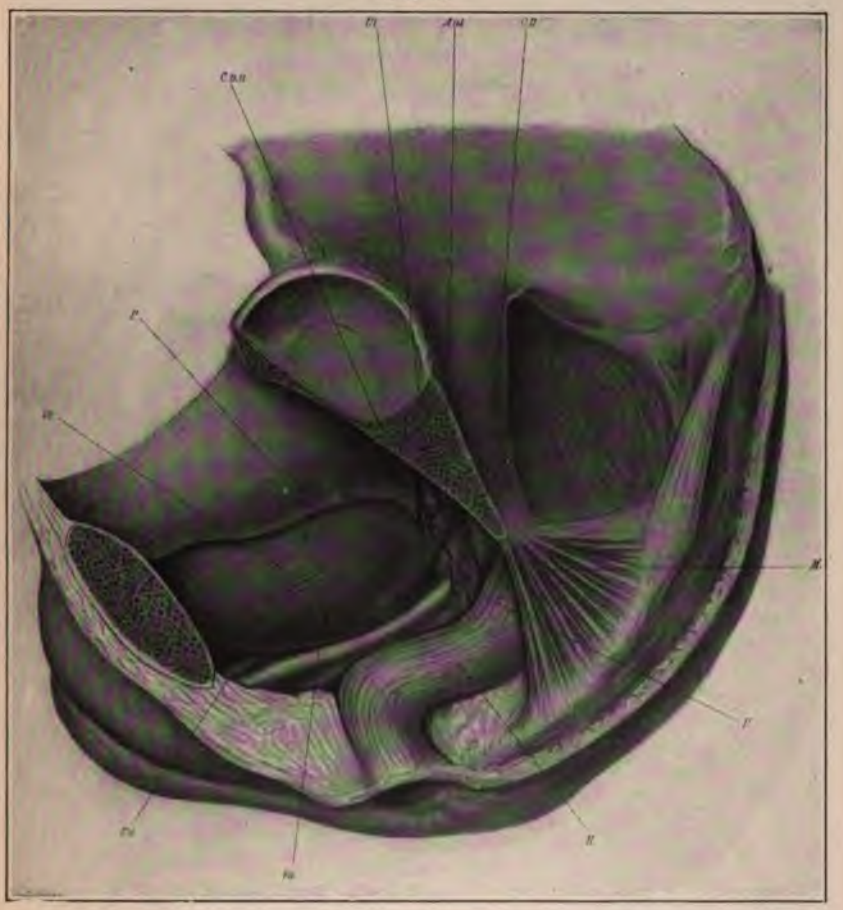
Relation of the ureters to the uterus misplaced to the left with exposure of the vesical portion of the ureter: *A.ut.*, uterine artery; *C. D.*, Douglas' cul-de-sac; *C. gl.*, glenoid cavity; *Cl.*, clitoris; *Cx. C.*, cervical canal; *F. o.*, obturator fascia; *M.o.i.*, internal obturator muscle; *Os.p.*, pubic bone; *P. F.*, perirectal fat; *Pl. r.u.*, rectouterine fold; *R.*, rectum; *Tr. ve.*, vesical trigonum; *U.*, ureter; *Ve. W.*, bladder wall; *V.ut.*, uterine vein. (Tandler u. Halban.)

removed the resulting ureteritis will usually disappear. Local treatment by irrigation through the ureteral catheter may be advisable in some cases, particularly if stricture or sacculation of the ureter be present, and especially when pyelitis or renal infection be present. But for simple ureteritis the advantages of such methods may well be questioned, as the traumatism incident to ureteral catheterization sometimes more than counterbalances the beneficial effects of the irrigation.

URETERAL STRICTURE.

This condition usually arises from ureteritis, though syphilis and tuberculosis act as causes occasionally. Strictures may be single or multiple and may be present in one or both ureters. They may be fusiform or in close proximity to each other, or one may be several inches

FIG. 319



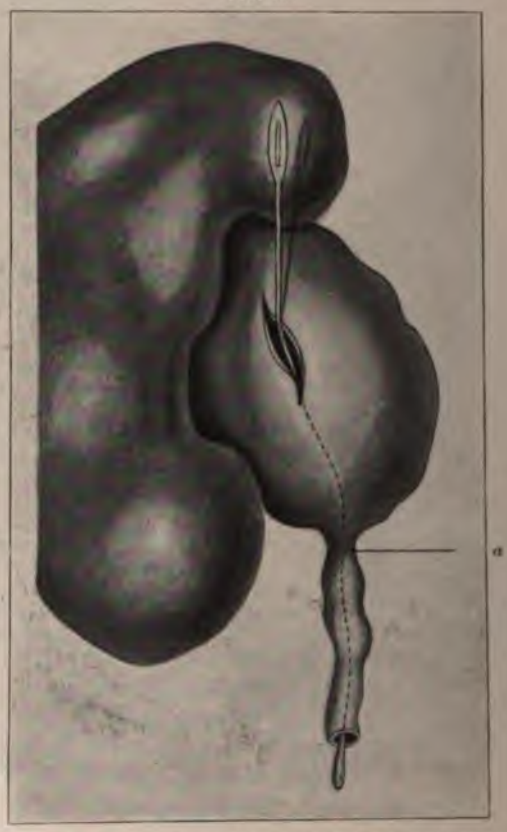
Showing relations of the ureter, bladder and uterine artery, lateral view: *A.ut.*, uterine artery; *C.D.*, Douglas' pouch; *C.v.u.*, vesicouterine pouch; *M.c.*, coccygeus muscle; *P.*, peritoneum; *R.*, rectum; *U.*, ureter; *Ua.*, urethra; *Ut.*, uterus; *Va.*, vagina; *Ve.*, urinary bladder. (Tandler u. Halban.)

from another. Should they be formed at either of the three narrowed points of the ureters their constriction need not be much to be serious. They interfere to variable extents with the passage of urine along the duct, sometimes causing complete obstruction.

Symptoms.—Ureteral stricture gives rise to localized colicky pains due to retention of urine for short periods of time and preceded by evidence of ureteritis. The symptoms of both may be present as ureteritis localized about the stricture is commonly present. Rarely pus or blood or both is noticed in the urine. When the stricture nearly or completely obstructs the flow of urine renal crises are noted and hydronephrosis or pyonephrosis may result with their symptom-complex added.

Diagnosis.—The diagnosis is based upon the localized symptoms and the passage of ureteral bougies which note the location of the stricture

FIG. 320

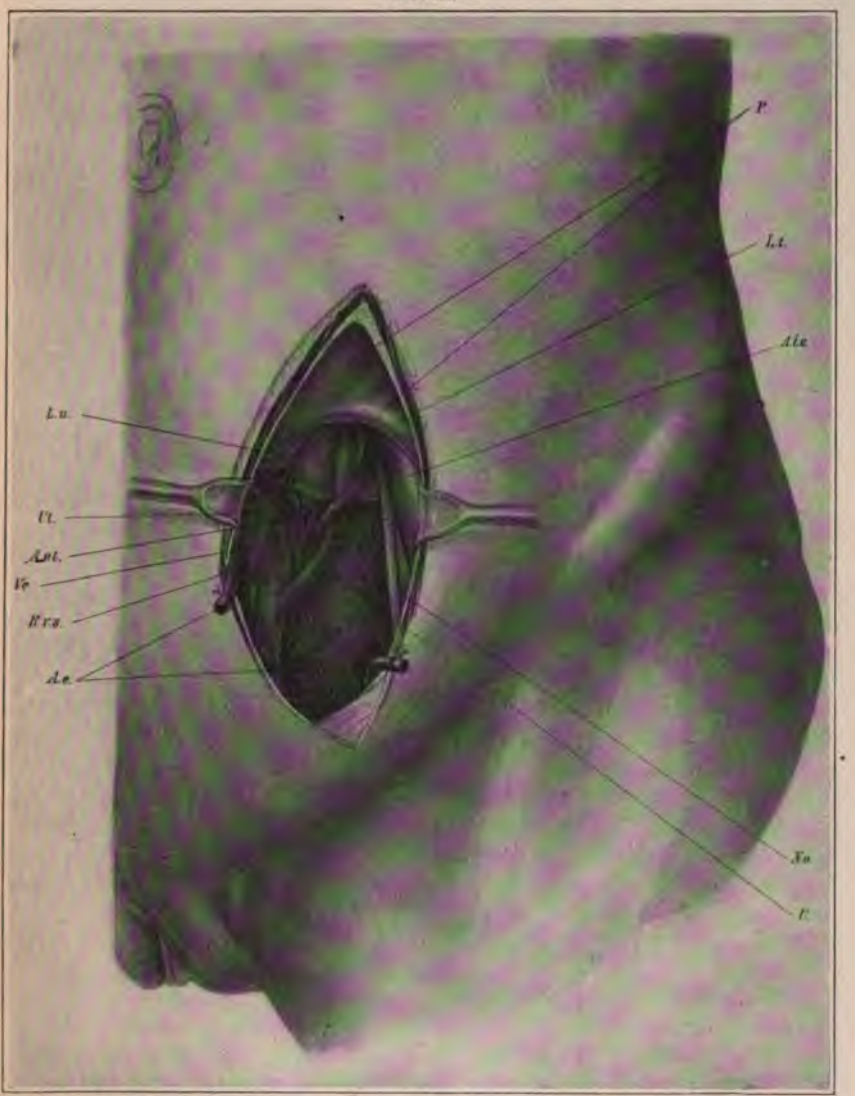


Ureteral stricture causing distention of pelvis and slight hydronephrosis: a, point of stricture.

or strictures. They are to be differentiated from valve-like constrictions and kinks and calculi in the duct by the employment of the *x*-ray, palpation, and the ureteral bougie, especially the wax-tipped one invented by H. A. Kelly. The valve-like constrictions and kinks give rise to hydronephrosis and may readily admit the passage from below of the bougie. A ureteral catheter will remove a large quantity of pale urine and cause relief to the patient.

Treatment.—The treatment in mild cases consists of causing diuresis and dilatation with the ureteral bougie and ureteral irrigation. When

FIG. 321



Extraperitoneal appearance of ureter entering the bladder: *A.e.*, epigastric artery; *A.i.e.* external iliac artery; *A.ut.*, uterine artery; *L.t.*, round ligament; *L.u.*, lateral umbilical ligament; *N.o.*, obturator nerve; *P.*, peritoneum; *R.v.s.*, superior ramus of the bladder; *U.*, ureter; *Ut*, uterus; *Ve.*, bladder. (Tandler u. Halban.)

syphilis is thought to be the cause appropriate medication should be instituted. When tuberculosis is the acting agent it may have reached

the organ from surrounding structures and not already spread along the duct. It may, therefore, give rise to the question as to whether resection of the strictured portion may be sufficient or whether the kidney or bladder is not involved. In this latter some more radical procedure,

FIG. 322

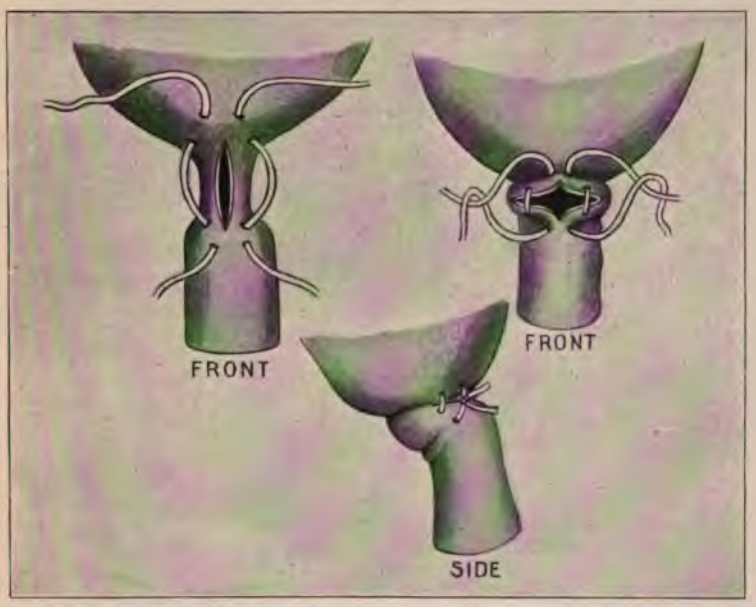
Adhesions between kidney and pelvis and ureter, causing distortion of ureter.

such as ureterectomy, partial or complete, or even nephrectomy, may be required. Appropriate treatment of the bladder may be necessary. In severe strictures resection will be necessary. Even ureterectomy has been required in some instances.

VALVE-LIKE CONSTRICTIONS AND KINKS.

These malformations are formed from periureteritis, which causes bands of adhesions to the ureter and which, contracting, tend to bend markedly a small portion of the duct. Pressure from other organs, either normal or pathological, sometimes causes these kinks. Kidney displacement also tends to angulation of the ureter, and no doubt some cases are congenital. Their tendency is to obstruct the flow of urine, and the resulting accumulation above emphasizes the constriction.

FIG. 323



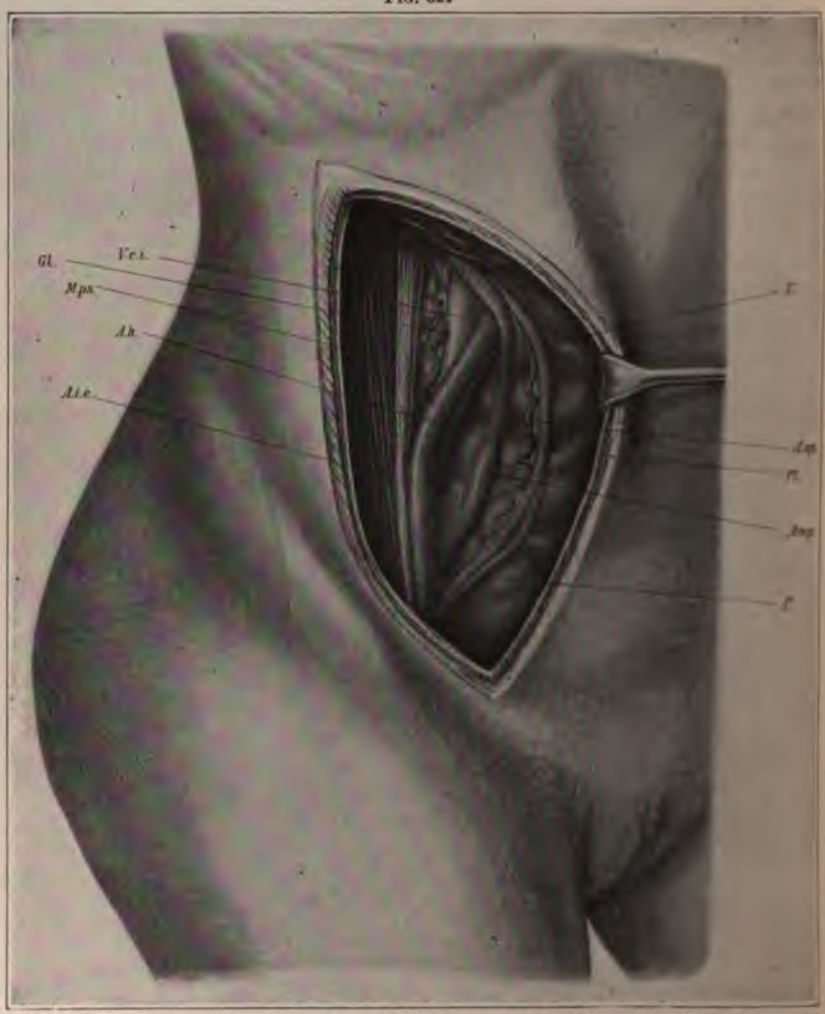
The mode of applying the sutures after division of a ureteral stricture or a valve.

Diagnosis.—Determination of the existence of such kinks or constrictions is very difficult. Should careful examination reveal a displaced kidney, a fluctuating renal tumor without pyuria, or the presence of anything compressing a ureter presumption of these conditions is warranted. A history of renal crises is additional evidence, and the passage of a ureteral catheter with little evidence of constriction and the withdrawal through it of a considerable quantity of urine makes the diagnosis quite certain.

Treatment.—This consists of removing any known cause. Adjacent tumors should be removed and fixation of a displaced kidney done. Locally some plastic operation, such as devised by Küster or Fenger,

should be practised. Aspiration of the urine is occasionally required, though rarely.

FIG. 324



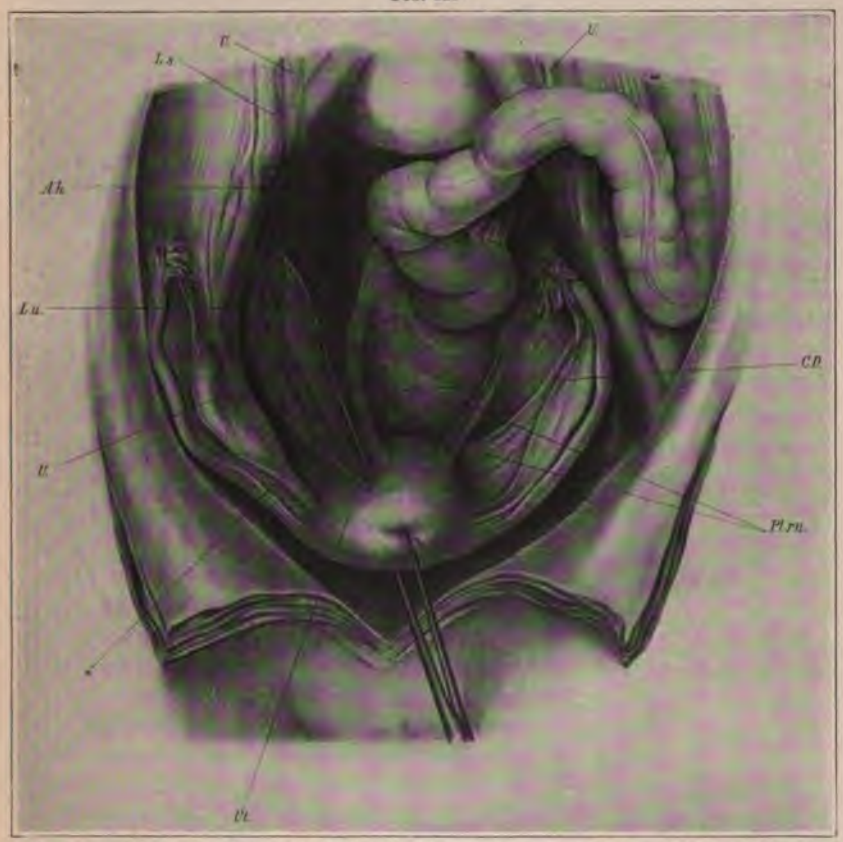
Retroperitoneal appearance of the ureter: *A.h.*, hypogastric artery; *Amp.*, ampullæ of the ureter; *A.sp.*, ovarian or spermatic artery; *A.i.e.*, external iliac artery; *Gl.*, lymphatic gland; *M.ps.*, psoas muscle; *P.*, peritoneum; *Pl.*, ovarian plexus; *U.*, ureter; *V.c.i.*, inferior vena cava. (Tandler u. Halban.)

TUBERCULOSIS.

Tuberculosis of the ureter is a not uncommon disease and usually results from descent of the disease from the kidney or its ascent from the bladder. It rarely invades the ureter from contiguous structures, and rarely through the blood from distant foci. Rarely is it the acute

miliary form, but commonly takes that of the caseous or fibroid variety. In the caseous form the bacillus is not easily found in the tissues of the ureter, though urinalyses may prove their presence. The mucosa is usually swollen and cloudy and showing areas of denudation. The wall is markedly enlarged by deposits of a fibrous hyperplasia. Pockets may be found in the wall filled with debris consisting of caseous pus, broken-down epithelial cells, and tubercle bacilli. Frequently blood clots are found mingled with such masses.

FIG. 325



Exposure of the ureters in total abdominal hysterectomy, ureter entering right broad ligament: *A.h.*, hypogastric artery; *C. D.*, Douglas' pouch; *L.u.*, lateral umbilical ligament; *L.s.*, suspensory ligament; *Pl.r.u.*, rectouterine fold; *U.*, ureter; *Ut.*, uterus. (Tandler u. Halban.)

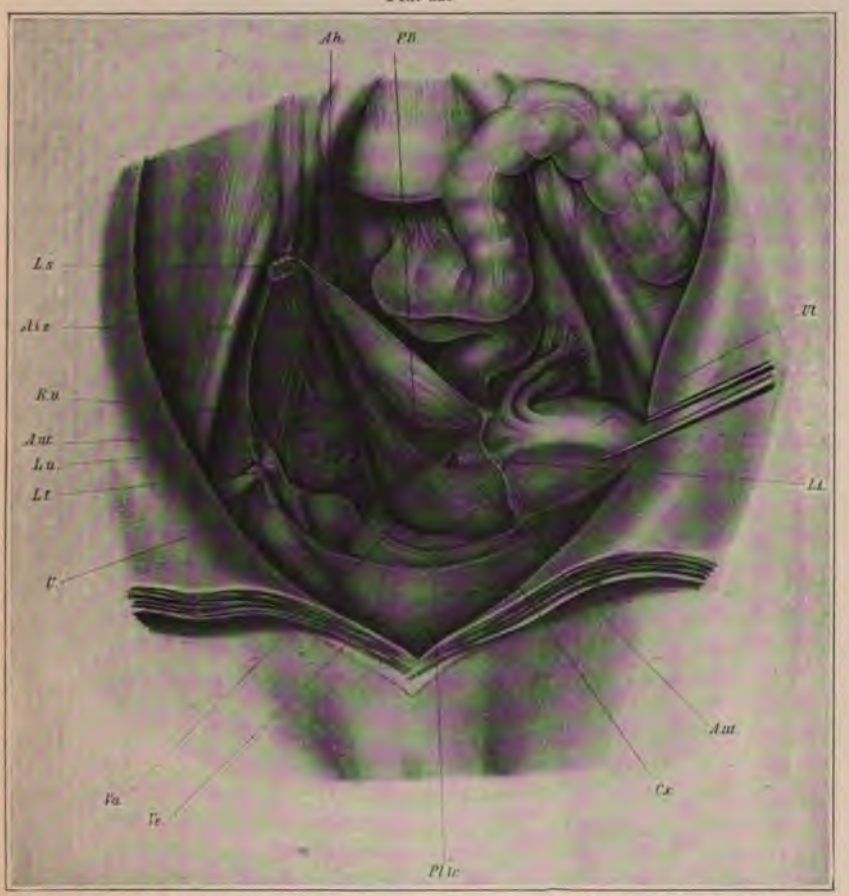
Symptoms.—Tuberculosis of the ureter gives rise to great distress in the way of very marked bladder tenesmus and localized pain. The temperature is irregular, as is common in tuberculosis in other localities, the pulse is rapid and in a few cases I have observed marked increase of respiration. In one patient a slight hacking cough and a respiration of 55 in the daytime led to unusually critical examinations of the throat

and lungs by some clever clinicians, and J. J. Carroll, U. S. Army, reported absence of bacilli from the sputum. In advanced cases of ascending tuberculosis the lower end of the ureter may become choked, and, backing up urine, give rise to renal crises, hydronephrosis, or pyonephrosis on the affected side. The condition involves both sides in about one-third of the descending cases and in greater proportion in those cases beginning with tuberculous cystitis. The ureter is felt as a cord-like structure, smooth or nodular, the extent and location of which varies with the degree of involvement of the duct and the direction of the infection. Through the anterior vaginal wall it is easily felt when the pelvic portion is involved. Not all patients suffering from ureteral tuberculosis are emaciated or even spare. This is especially true of those in which the disease is descended from a kidney and in which the kidney has been removed some time before.

Diagnosis.—Very frequent urination or vesical tenesmus, fever, urine containing pus and debris holding tubercle bacilli, a cord-like ureter, and severe localized pain are sufficient upon which to base a diagnosis. Unfortunately in most cases these are symptoms of advanced tuberculosis. Early in the disease no debris is present unless it comes from the kidney or bladder. The cord-like ureter occurs late in the disease. But bladder irritation and localized pain occur early and tubercle bacilli in the urine may be detected in a considerable proportion of cases. In renal tuberculosis the bladder irritation and pain along the ureter are not common symptoms, and in vesical tuberculosis the latter symptom is not present as a rule. Besides, involvement of either of those organs produces characteristic symptoms mentioned in consideration of those subjects. It is to be distinguished from ureteral or renal calculus, in which the quantity of urine is apt to be decreased and contain small fragments of stone, which in passing causes sharp, severe pain, with intervals of freedom, without tubercle bacilli in the urine, and perhaps no fever, and from intermittent hydronephrosis, which gives rise to sharp and sudden attacks of colic, with urinary retention, or with painless voiding of a large quantity of urine, at the end of the attack, instead of frequent and painful micturition covering a long period of time. Many urinalyses may be necessary to find tubercle bacilli, and care must be exercised to differentiate between them and smegma bacilli. In my collection of 14 cases of complete nephroureterectomy for tuberculosis the bacillus was found in but 6 of the 10 studied cases. Forssell recommends the following method to accurately determine the presence of tubercle bacilli in urine. He puts 1000 c.c. of urine in a glass tube tapering to a point below where there is a glass screw cock. It is set aside for twenty-four hours. The cock is then turned and the lower part of the contents drawn out into two strong glass pipettes tapering abruptly to a point. They are centrifugalized for fifteen to twenty minutes. Examination of one or several glasses spread with the contents of the tip of one of these tubes will decide the question. It should be remembered that when the bladder is not involved the diseased ureter may be occasionally blocked and tubercle bacilli thus

prevented from contaminating normal urine from the fellow-organs. When no tubercle bacilli are found the tuberculin test and animal inoculation are still at our disposal. No reaction from the tuberculin test is very strongly indicative of absence of the disease, but reaction only proves the presence of it in some portion of the body, not necessarily the urinary tract. Tuberculosis in guinea-pigs may be produced by

FIG. 326



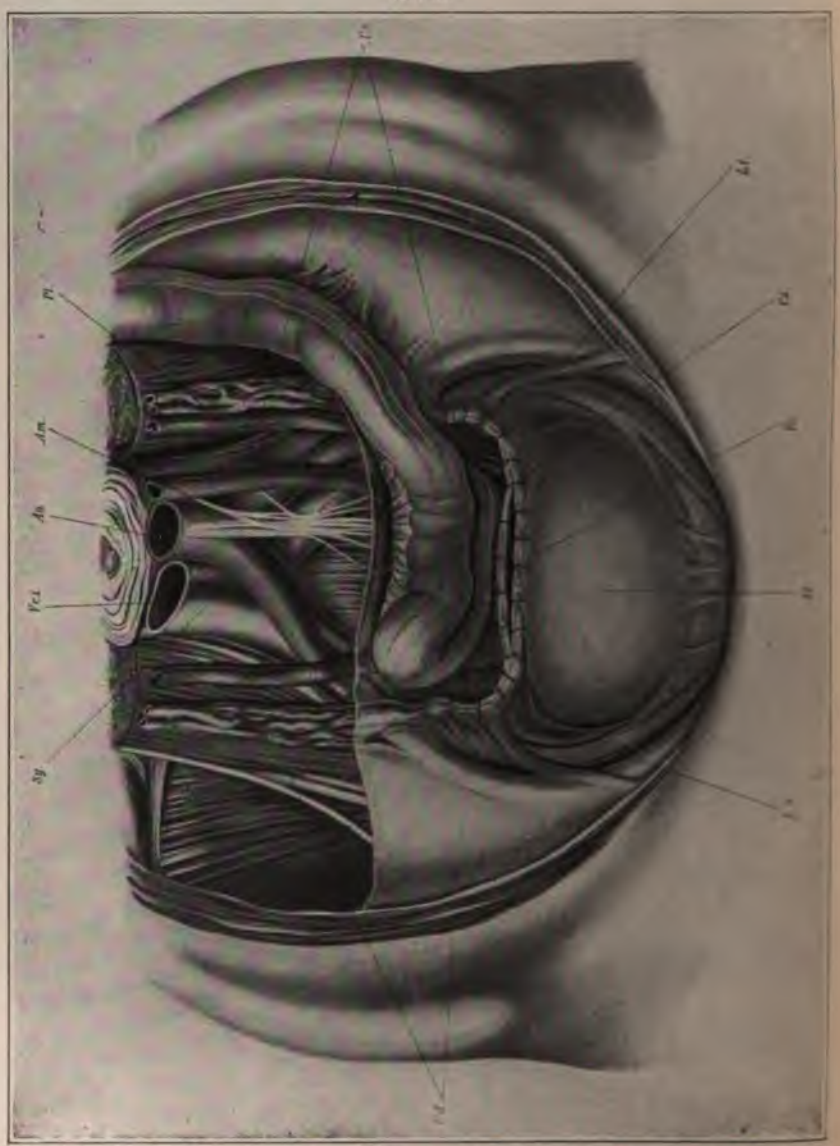
The same as Fig. 325, showing right ureter liberated from parametrium. The uterine and ovarian arteries and the round ligaments severed: *A.h.*, hypogastric artery; *A.i.e.*, external iliac artery; *A.ut.*, uterine artery; *Cx.*, cervix uteri; *L.s.*, suspensory ligament; *L.t.*, round ligament; *L.u.*, lateral umbilical ligament; *P.B.*, parametrium; *Pl. tr.*, transverse vesical fold; *R.v.*, superior vesical artery; *U.*, ureter; *Ut.*, uterus; *Va.*, vagina; *Ve.*, bladder. (Tandler u. Halban.)

inoculating them with urine from a tuberculous urinary tract, although search for the bacillus in it was futile.

Prognosis.—The result of ureteral tuberculosis depends upon the extent of the disease locally and whether other foci are present in the lungs, pleura, meninges, peritoneum, or other structures. If the local

infection is extended to the corresponding kidney only complete nephro-ureterectomy will usually eradicate the disease. And this holds good,

FIG. 327

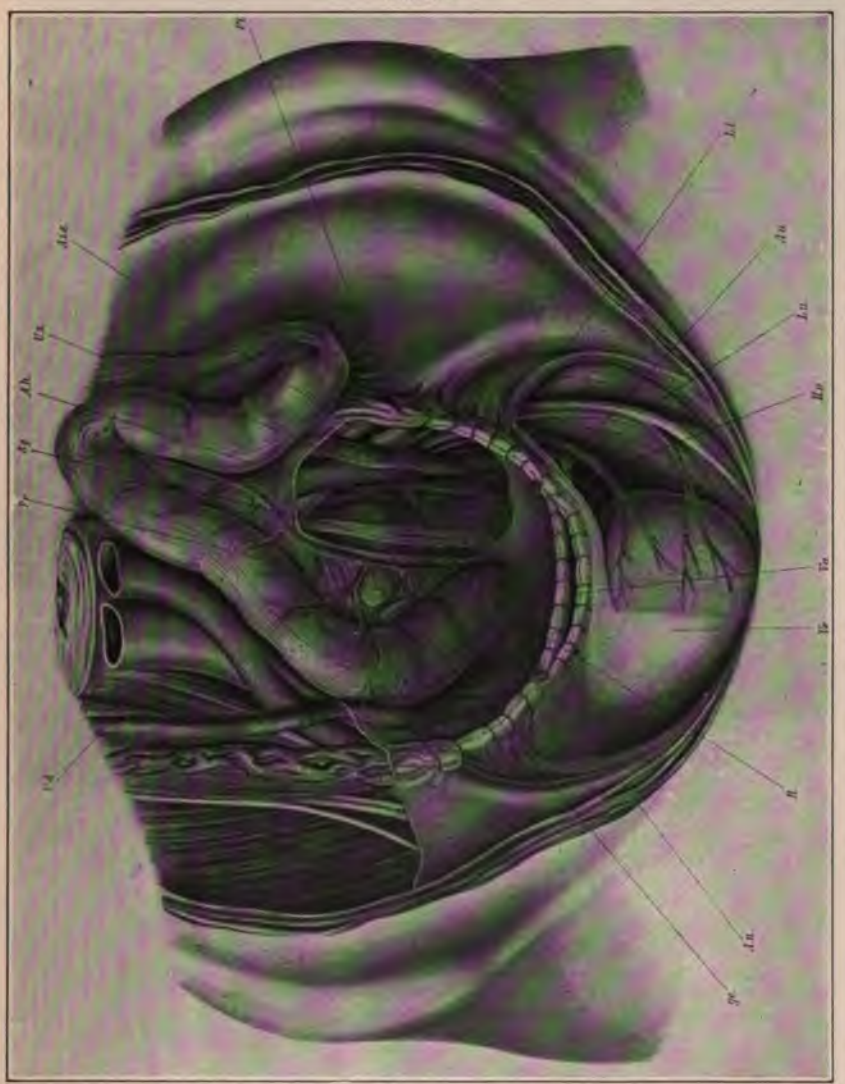


The same as Fig. 326, showing relation of ligatures and sutures to the liberated ureters; *A.m.*, inferior mesenteric artery; *Ao.*, aorta; *C.s.*, sigmoid colon; *L.t.*, round ligament; *L.u.*, lateral umbilical ligament; *Pl.*, ovarian plexus; *Sy.*, sympathetic; *U.d.*, right ureter; *U.s.*, left ureter; *Va.* vagina; *Ve.*, bladder; *V.c.i.*, inferior vena cava. (Tandler u. Halban.)

even though a considerable descending involvement of the bladder is present. If the opposite kidney is infected, as was found by Albarran

11 times in 32 cases, the outcome is very unpromising. If the disease has spread from the bladder up one or both ureters the outcome may be

FIG. 328



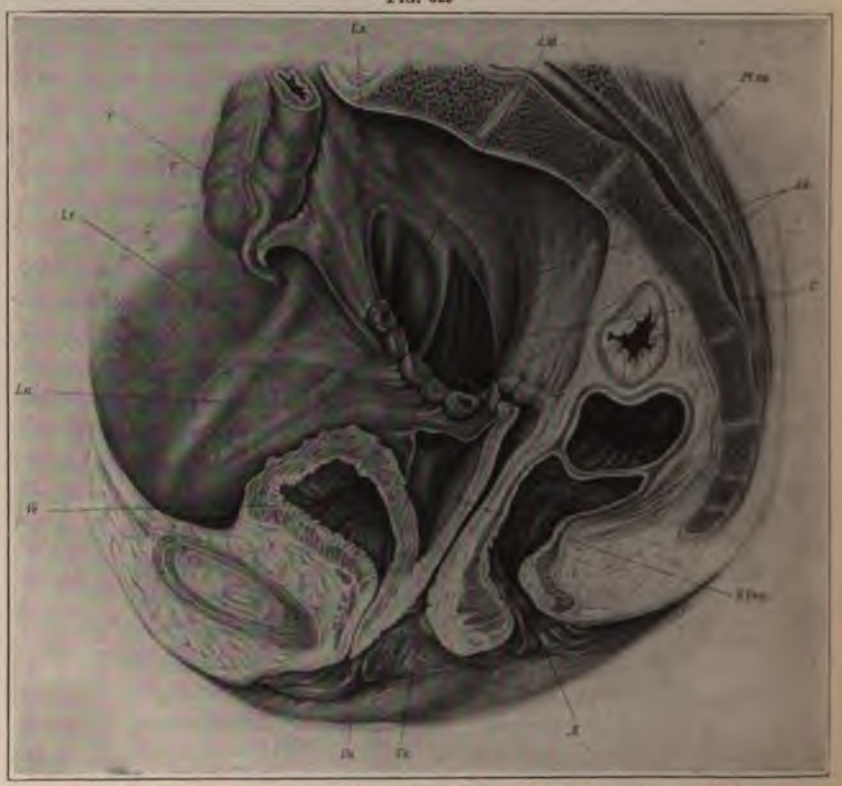
The same as Fig. 327, showing relation of the ureters to the ligatures: *A.i.e.*, external iliac artery; *A.h.*, hypogastric artery; *A.u.*, uterine artery; *Ge.*, lymphatic gland; *L.t.*, round ligament; *L.u.*, lateral umbilical ligament; *Pl.*, ovarian plexus; *Pr.*, sacral promontory; *R.*, rectum; *R.v.*, superior vesical artery; *Sy.*, sympathetic; *U.d.*, right ureter; *U.s.*, left ureter; *V.a.*, vagina; *Ve.*, bladder. (Tandler u. Halban.)

satisfactory in early cases with prompt and appropriate treatment. Of course, involvement of one is more favorable than of both ureters. In

advanced cases, in which descending ureteral tuberculosis has occurred on both sides, fatal results must be the ultimatum. In early cases of any form climatic and other appropriate treatment should give good results. When foci in other organs are present eradication of the disease is not to be expected.

Treatment.—In early cases climatic treatment is of great importance. If the involvement be ascending then energetic vesical irrigation should be employed. In those late cases, in which the kidney involvement of

FIG. 329



Sagittal section, showing the same on one side: *A.sp.*, ovarian artery; *A.u.*, uterine artery; *C.*, cæcum and vermiform appendix; *H. Vew.*, posterior wall of the bladder; *L.s.*, infundibulo-pelvic ligament; *Lt.*, round ligament; *L.u.*, lateral umbilical ligament; *Pl.r.u.*, rectouterine fold; *R.*, rectum; *U.*, ureter; *Ua.*, urethra; *Va.*, vagina; *Ve.*, bladder. (Tandler u. Halban.)

both sides is primary, but tentative, relief will result from any form of treatment. This may be required for temporary purposes. Nephrectomy or even nephroureterectomy may be advisable when only one side is markedly involved. When the descending disease is unilateral and advanced the latter operation is almost a necessity. Cryoscopy should be employed in doubtful cases. The primary mortality in my table of 14 complete nephroureterectomies was 2.

TUMORS OF THE URETER.

New-growths developing from the ureter are very rare and particularly may this be said of the intrapelvic portion. In 1900 Albarran collected 42 cases. They are cystic and solid, benign and malignant. Henry Morris, in his excellent work on *Surgical Diseases of the Kidney and Ureter*, gives an illustration of a very interesting case of ureteral cysts containing coccidia. The kidney was granular and cystic. Cysts containing another form of parasite, the psorosperm, have been observed a few times. Rarely are they of granular origin. Papillomata was recorded in 18 of Albarran's table of 42 cases. This form of tumor has been found in every part of the duct. Some of them are malignant. Sarcoma and myosarcomata are here met with, as well as carcinomata, as primary growths. In some cases calculi have been thought to have a causal relation. Very frequently the ureter is invaded by a new-growth springing from another organ either by contiguity or as secondary deposits.

Symptoms.—The principal symptoms are pain, hemorrhage, and a mass to be felt upon palpation. Of these hemorrhage is the most common and is usually intermittent. The presence of a tumor is usually a later symptom. Pain may or may not be a symptom and may occur at any time during the progress of the disease. If the ureter be obstructed by debris or blood clot pain will result. The urine contains blood and rarely fragments of the tumor. Usually the fragments do not signify the character of the growth.

Diagnosis.—This is extremely difficult in all except the rarest cases—those in which a cystoscopic examination reveals a protruding mass from the ureter on the side corresponding to the tumor, and from which analysis of the segregated urine demonstrates to be the source of the blood loss.

The diagnosis would be presumptive if a mass were felt along the course of one ureter and blood and debris were found coming from that and not the fellow ureter. If the mass were in the region normally occupied by the kidney, involvement of the pelvis alone would be difficult to differentiate from involvement of the kidney alone or in addition.

Prognosis.—As a rule, prognosis of the tumor of the ureter is unfavorable, though better results are to be expected if the tumor be cystic. Even here extension from the efforts of the existing parasite is to be expected except in cases of eradication of the ureter.

Treatment.—This consists of complete nephroureterectomy, except when in early cases the involvement of the ureter seems limited to the lower extremity. In such cases extirpation of the diseased portion with grafting of the ureteral stump into the bladder or some other place should be done.

In all cases, not too extensive, operation should be done at the earliest possible moment.

CALCULI.

Ureteral calculi are very common and rarely originate in the ureter, but are commonly formed in the kidney and carried into the duct by gravity, force of the urinary current, and the intermittent contraction waves of the ureter. They may form in the ureter by the deposition of

FIG. 330

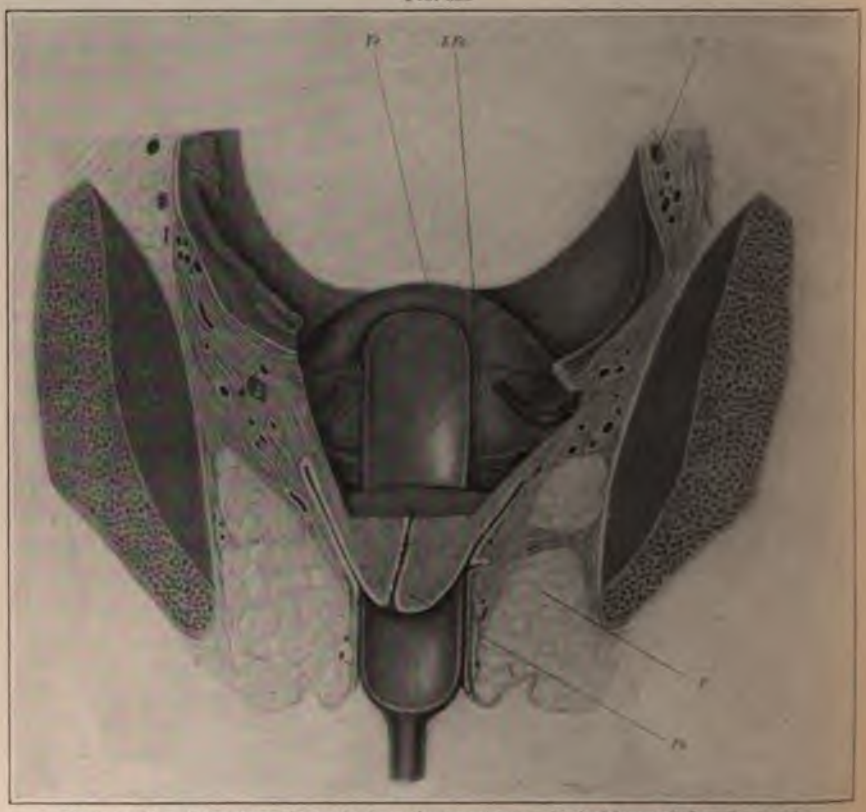
Diagram of course of ureter, showing the usual locations of ureteral calculi.

phosphatic salts just above a stricture or about a foreign body, such as a catheter left in for some time or sutures penetrating the mucosa. Calculi remain impacted in the ureter for an indefinite time. They may by repeated exertion of the ureter be expelled into the bladder. They may remain for a considerable time lodged at the first normal

pain is noticed to become progressively nearer the outlet. The urine may occasionally contain fragments or blood.

Diagnosis.—This depends slightly upon the subjective symptoms, but more upon physical examination. If a careful examination be made with full general anæsthesia in a large proportion of cases in thin women, the presence of calculi in the ureter can be detected. Next to this comes the urinalyses to be frequently made. The presence of blood, and especially fragments of calculi, will be presumptive evidence, though it is strengthened by the presence of pus. Urine segregation will materially

FIG. 332



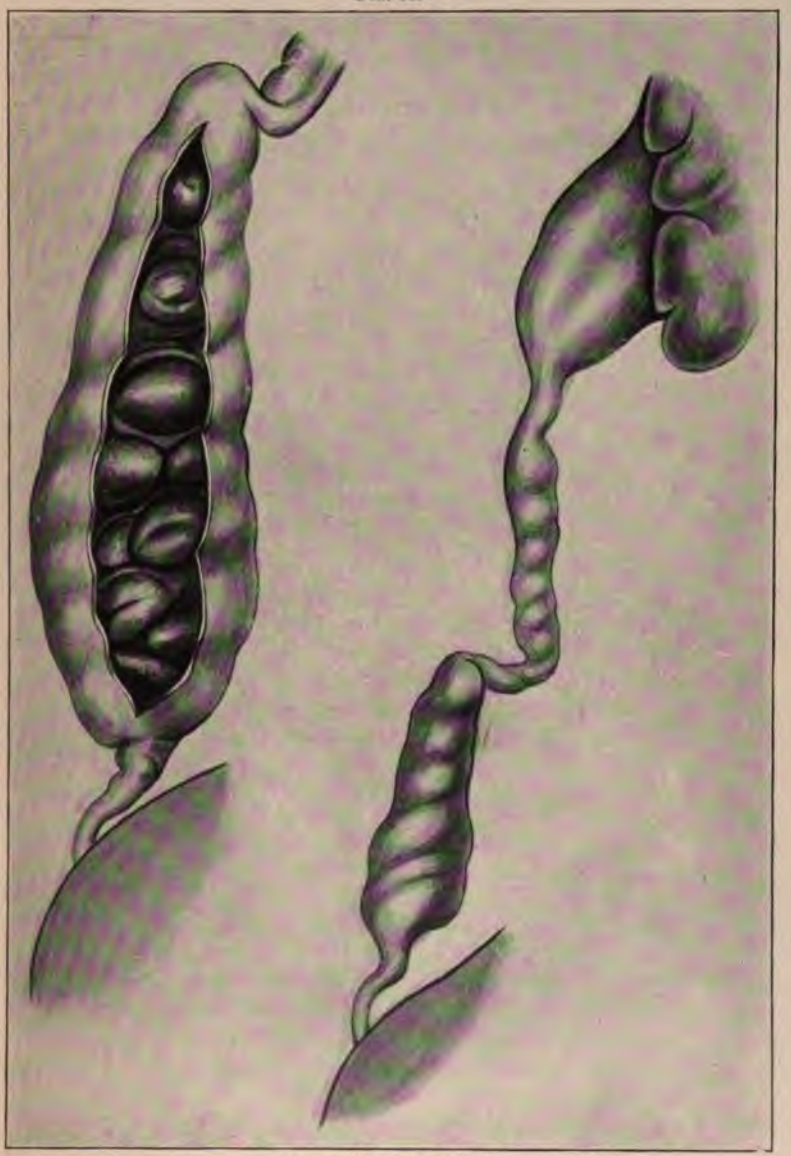
Topography of structures in vaginal panhysterectomy: *F*, ischiorectal fat; *Po*, portio vaginalis; *S. Va.*, vaginal incision; *U.*, ureter; *Ve.*, bladder. (Tandler u. Halban.)

assist, for usually no urine will be secured from the affected side. The passage of a ureteral catheter or bougie, particularly the wax-tipped one devised by Kelly, will usually locate the calculus. The Roentgen ray will detect calculi when they are composed quite largely of inorganic salts, but they will elude the highly scientific radiographs if composed entirely of organic salts or acid. The future will probably do much toward perfecting this method of diagnosis.

Treatment.—Removal of the calculus should be the result desired. In some cases nature does this, but in most it is left to the surgeon.

The transperitoneal route should never be the one of choice, owing to the danger of peritoneal infection from infected urine—a common condition associated with ureteral calculi. If the calculus is in the pelvis or

FIG. 333

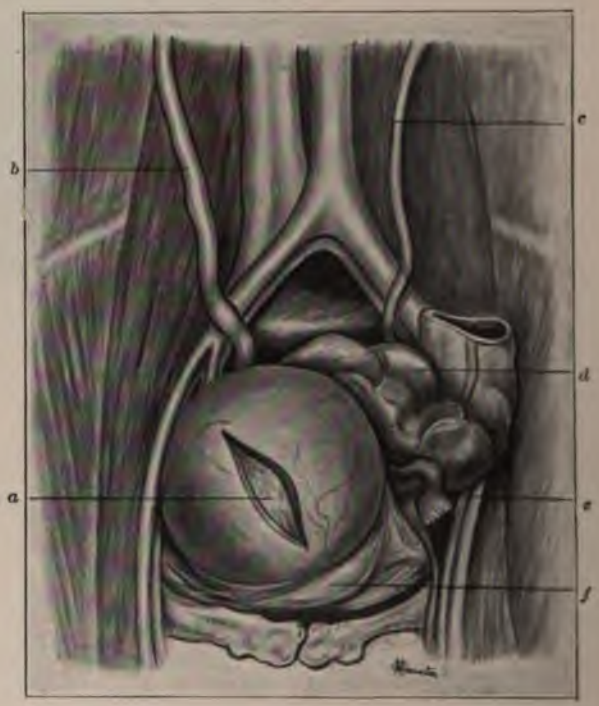


Ureters filled with calculi.

the ureter or any other portion above the iliac vessels the loin incision is the best. If in the broad ligament a vaginal incision will reach it, and if protruding at the ureteral orifice urethral dilatation and transvesical

extraction is the preferable method. In the remaining portion of the duct the stone can best be reached through an incision about an inch

FIG. 334



Ureteral calculus of enormous size situated at ureterovesical junction and partly within bladder wall: *a*, calculus; *b*, thickened right ureter; *c*, left ureter; *d*, sigmoid; *e*, left Fallopian tube *f*, bladder pushed to one side.

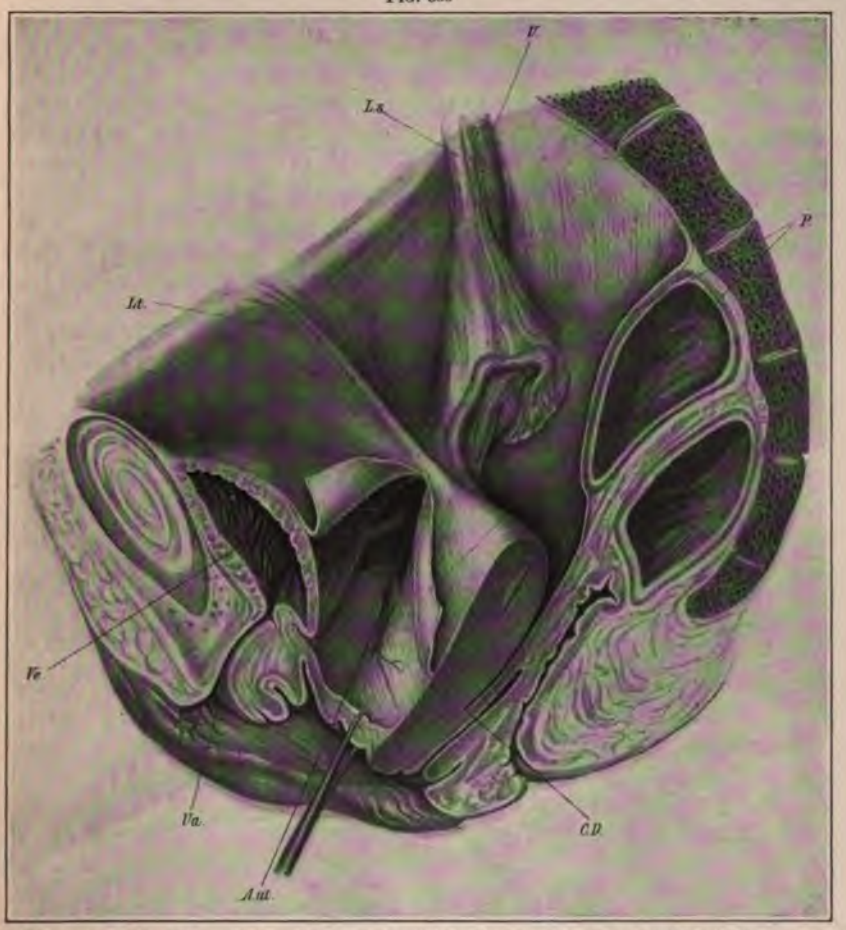
FIG. 335

Section of ureteral calculus. Weight, 1310 grains. Dimensions, 2¾ in. x 1¾ in. x 1⅛ in. (Author's case.)

above and paralleling Poupart's ligament. It may be continued upward and outward if necessary. The longitudinal opening in the ureter

should be closed by suture if the urine is normal, and not otherwise. Drainage will be necessary if the urine or the wound should be infected or if a large pocket is left. In all other cases closure of the wound may safely be done. After removal of the calculus one should

FIG. 336



The same as Fig. 332, sagittal section to show relation of ureters to vagina and partially removed uterus: *A. ut.*, uterine artery; *C. D*, Douglas' pouch; *L. S.*, infundibulo-pelvic ligament; *L. t.*, round ligament; *P.*, peritoneal wound; *U.*, ureter; *Va.*, urethra; *Ve.*, bladder. (Tandler u. Halban.)

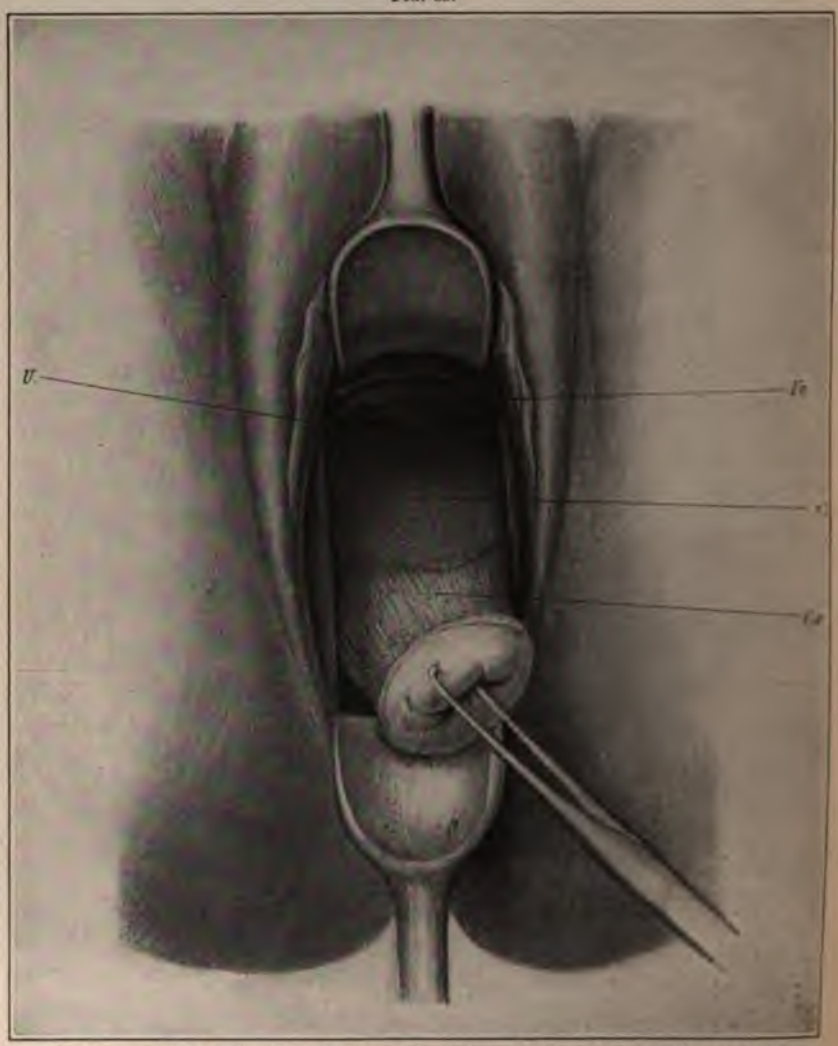
always explore the ureter to be certain of its being completely free of obstruction.

CALCULOUS ANURIA.

This condition is one of the utmost gravity, and is caused by complete obstruction of at least one ureter by calculi. The function of one kidney may have been suspended at some prior time from this or some other

cause, thus forcing the elimination of urine upon the other kidney. This condition if continuing beyond six weeks causes permanent absence of the function from the affected side. Segregation of urine and ureteral catheterization have shown this condition to be far more common than was formerly supposed. When this condition is present on one side

FIG. 337



The same as Fig. 336, location of ureters when uterus is drawn down: *U.*, ureter; *Bl.*, bladder; *Cx.*, cervix; *X.*, peritoneal fold. (Tandler u. Halban.)

and the ureter of the opposite is blocked by a calculus the life of the individual is in imminent peril. The urine excreted in calculous anuria is backed up and will be increased until the pressure from it in the dilated pelvis and kidney is fully as great as the blood pressure in the branches of the renal artery.

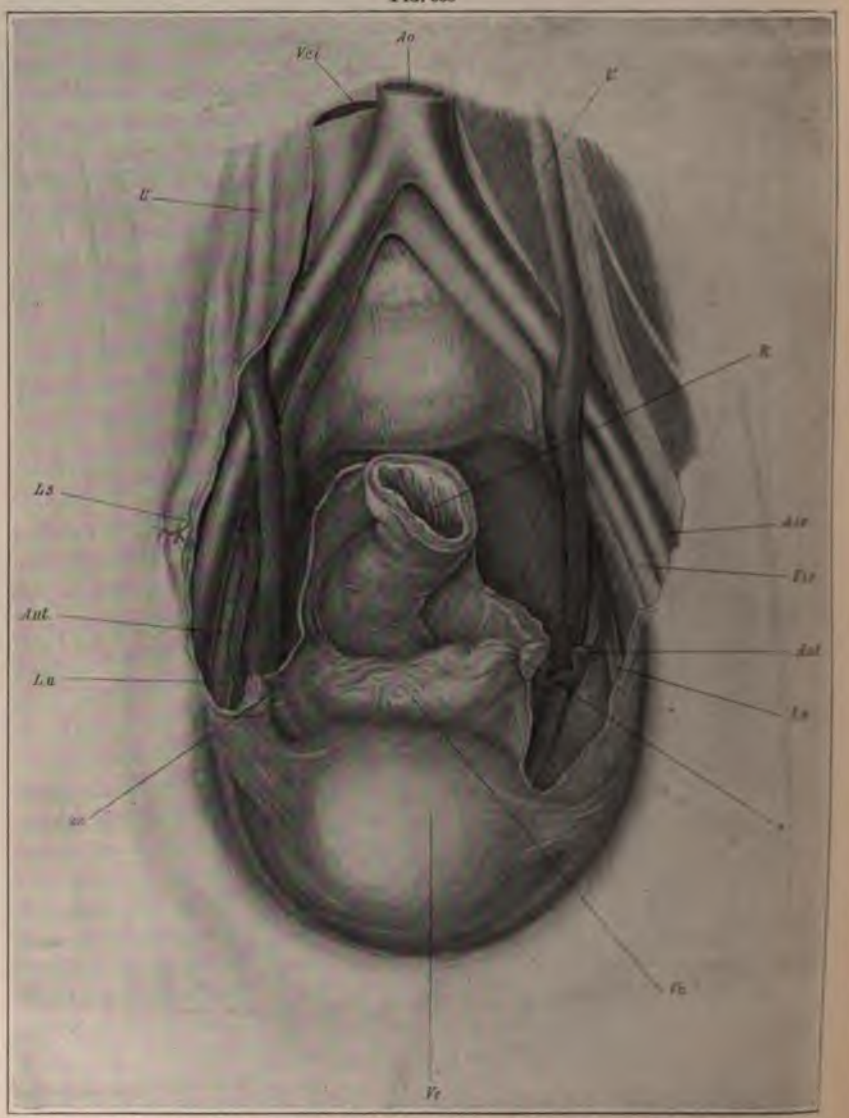
Symptoms.—The symptoms are entire absence of urine after a certain time well fixed in the individual's mind and coincident with it lumbar pain, dull and aching at first, but rapidly becoming acute and cutting, not changed by position and increasing in area. As the condition progresses the presence of a tumor in the lumbar region on one or both sides is noted and the evidence of urine retained in the system is manifest. The duration of the attack is apt to be short, as uræmic poisoning is rapidly fatal when not relieved, though life has been prolonged to almost fabulous periods oftentimes. Usually uræmia ends fatally in from three to ten days, though I am reminded of the celebrated case of S. C. Gordon, of Maine, in which the patient died, apparently of exhaustion, on the twenty-ninth day after extirpation of the only kidney.

Diagnosis.—The diagnosis is based upon the early history, which in some contains evidence of renal crises on one or both sides, the symptoms of the onset of the attack and the presence of an elastic tumor in one or both lumbar regions, the shape varying with the site of obstruction. The lower in the ureter it is located the more fusiform will be the swelling. Sometimes the presence of a calculus in the ureter may be discovered. But this rarely is possible and then only in thin subjects when the calculi are large and early in the attack. The Roentgen ray may demonstrate the presence of a calculus. The condition may be confounded with intermittent hydronephrosis, angulation of the ureter, or any other form of complete obstruction of the duct in which the history is nearly similar. The differential points are in the facts that double hydronephrosis is very rare from any other cause and has a history of slow development. It is apt to be intermittent. The pain is often relieved by change of position and large quantities of urine expelled simultaneously. When there has been pyonephrosis complicating the presence of calculus in the kidney the temperature has been elevated and the urine has likely contained pus. This evidence would be lacking in hydronephrosis.

Treatment.—This should be directed to enforcing urinary elimination upon the remaining active excretory structures. Hot baths and packs with hot and cold drinks with the hypodermic use of pilocarpin to enforce free elimination from the skin. To this may be added morphine, which has the triple action of relieving pain, lessening the renal activity, and increasing perspiration. Free purgation with podophyllin, calomel, elaterine, and other remedies increases elimination of urea and its relative compounds by the alimentary canal. The diet should be very light, consisting of liquids containing a liberal proportion of sodium chloride, thus introducing as little nitrogenous food as possible into the system. All this is merely palliative. It cannot be expected that the calculus will be dislodged on one or both sides allowing the urine to pass on into the bladder, though this may at times occur. As soon as calculous anuria is discovered attempts at removal of the obstruction should be made. Possibly reverse stripping of the ureter along the site of obstruction may rarely prove temporarily successful. The passage of a ureteral bougie may also push back the calculus, permitting the

passage of the pent-up urine. This is particularly applicable if the calculus be impacted at the outlet of the pelvis. These measures may

FIG. 338

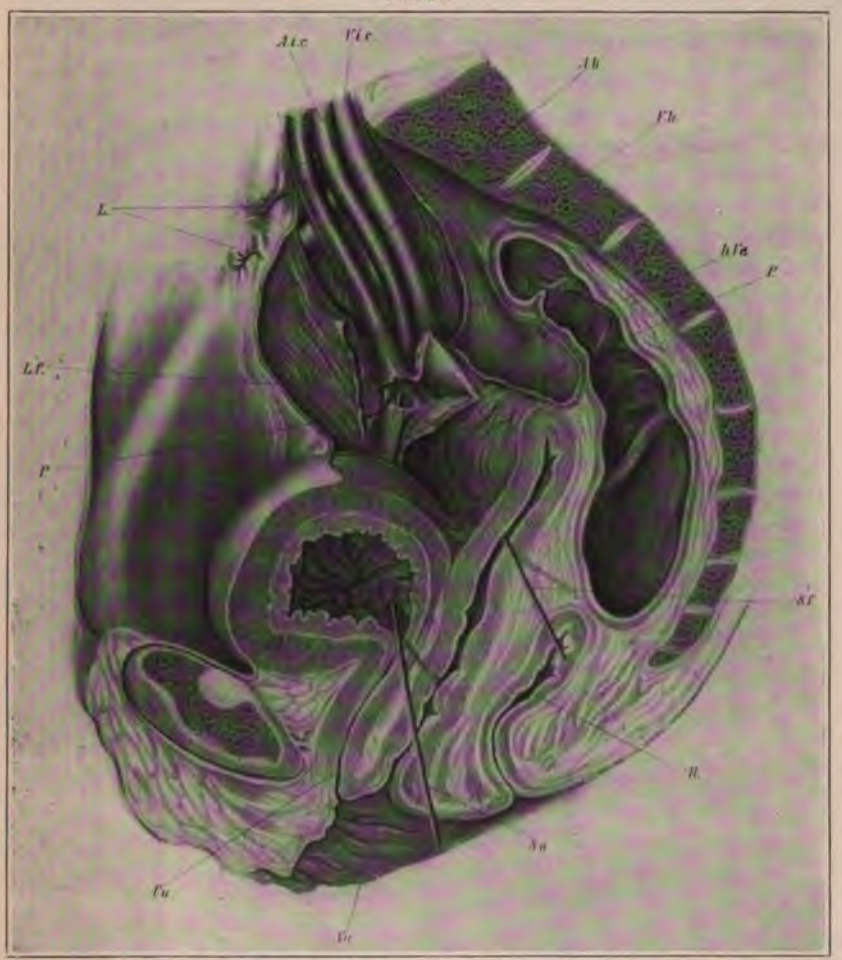


Showing ureterovaginal fistula made at time of ligation of right uterine artery in abdominal hysterectomy: *A. i. e.*, external iliac artery; *Ao.*, aorta; *A. ut.*, uterine artery; *L. s.*, infundibulo-pelvic ligament; *L. u.*, left umbilical ligament; *R.*, rectum; *U.*, ureter; *Va.*, vagina; *V. c. i.*, inferior vena cava; *Ve.*, bladder; *V. i. e.*, external iliac vein; *X.*, ligature on left uterine artery and *x x*, ligature on the right. (Tandler u. Halban.)

temporarily act satisfactorily by relieving the renal crisis, but so long as the calculus has smallest diameters in excess of that of the lumen

of the ureter a cure or relief for an appreciable length of time is not to be expected without removal of the calculus. If the tumor can be outlined or the *x*-ray determine the location of the calculus an incision directly over it should be made, the stone extracted, and the wound

FIG. 339



The same as Fig. 338, shown by sagittal section: *A. h.*, hypogastric artery; *A. i. c.*, common iliac artery; *h. Va.*, posterior vaginal opening (incision); *L.*, ligature on infundibulo-pelvic ligament; *L.f.*, ligature at point of fistula; *P.*, peritoneal flap; *R.*, rectum; *S.f.*, sound running from vagina through fistula; *S. u.*, sound in the ureter passed across bladder; *Ua.*, urethra; *Va.*, vagina; *V. h.*, hypogastric vein; *V. i. c.*, common iliac vein. (Tandler u. Halban.)

closed or left open for drainage according to the degree of erosion of the ureter or the constriction of it below the site of lodgement. The three normally narrow places near the pelvis, at the crossing of the iliac vessels and one inch from the bladder, as well as the great curve just

above the broad ligament, are elective sites for obstruction. Ureterolithotomy or nephrolithotomy may be required. Kollischer and Schmidt, of Chicago, have reported cases in which injections of albolene through a ureteral catheter have resulted in expulsion of the calculus into the bladder.

INJURIES.

Injuries of the ureter are very rare except those produced in the course of surgical operations. They may be conveniently classified as (*a*) penetrating, (*b*) subparietal, and (*c*) those resulting from surgical operations and tedious or instrumental labor. As might be inferred from consideration of the subject of calculous anuria, perforation of the peritoneum is a dangerous complication.

(*a*) **Penetrating Injuries.**—Penetrating wounds are usually caused by some kind of firearms and by pointed, cutting instruments, making stab wounds. But few cases have been reported.

(*b*) **Subparietal Injuries.**—Subparietal wounds are more common. The reported cases have been classified by H. Morris as:

1. Verified cases of rupture of the ureter.
2. Probable rupture of the ureter with extravasation.
3. Contracted ureter with hydronephrosis or other renal changes, possibly due to ureteral injury.
4. Not injuries of the ureter proper but rupture of the renal pelvis or renal substance, opening calices and giving rise to extravasation.

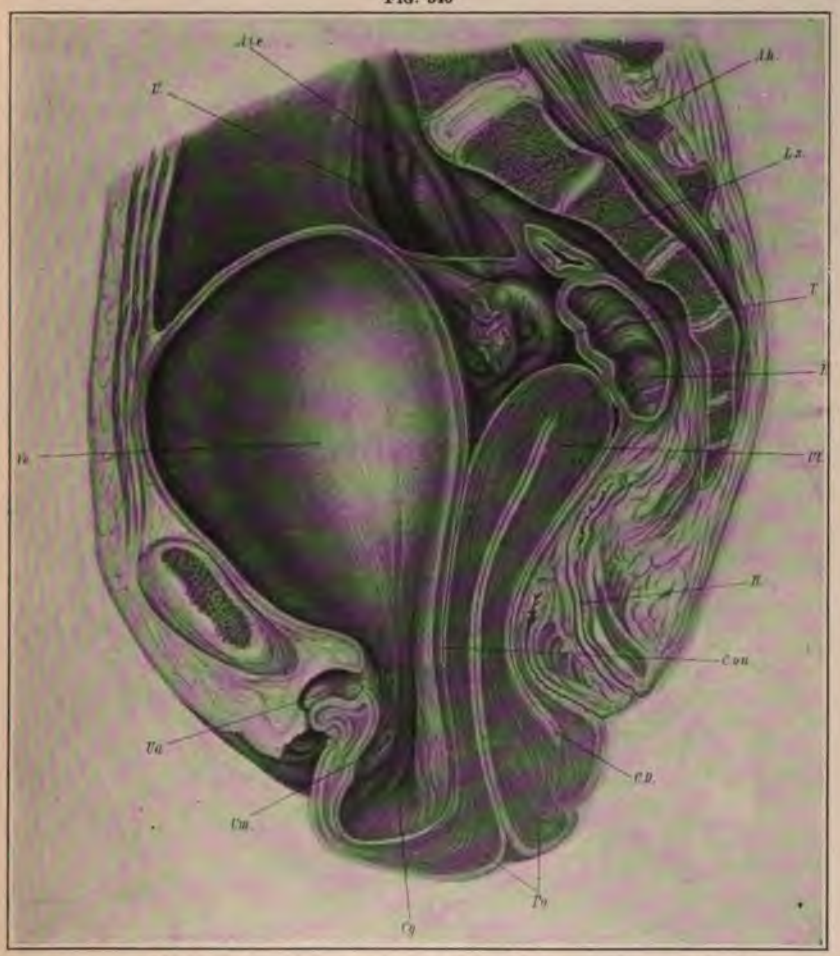
Causes.—Extreme violence is apparently necessary to produce such ureteral injuries, as the duct is very well protected by the ribs, pelvis, and spinal column. Kicks from horses, forcibly running against some projecting object—the abdomen receiving the impact, being run over by the wheels of heavy vehicles, falls—striking the lower part of the trunk against some hard projecting object, forcible compression of the lower abdomen between two hard bodies, and many other forms of violence are noted as causes. Compression of the ureter against the transverse processes of the vertebræ has been suggested by Tuffier as the usual cause of rupture of the ureter.

Symptoms.—The symptoms are not necessarily promptly noticed, though hæmaturia may cause suspicion of it. Pain and tenderness and occasionally frequent urination may occur early. There may be temporary occlusion of the ureter from injury to the wall or formation of blood clots in it, and, if double, complete suppression of urine occurs. If rupture has occurred, urinary extravasation will cause localized œdema and a fluctuating tumor if the peritoneum be not penetrated. If the leakage be directly into the peritoneal cavity, peritonitis with its symptoms must sooner or later be expected. Severe traumatism may so markedly interfere with the blood supply of the ureter that a late sloughing with urinary leakage may occur.

Diagnosis.—This is based upon a history of localized traumatism, pain, and, perhaps, tumor, hæmaturia, and, perhaps, urinary suppression

or greatly lessened quantity. Years later the possibility of constriction resulting from traumatism is not to be overlooked. If fistula remain for a considerable time it is evidence of ureteral rather than of renal injury.

FIG. 340

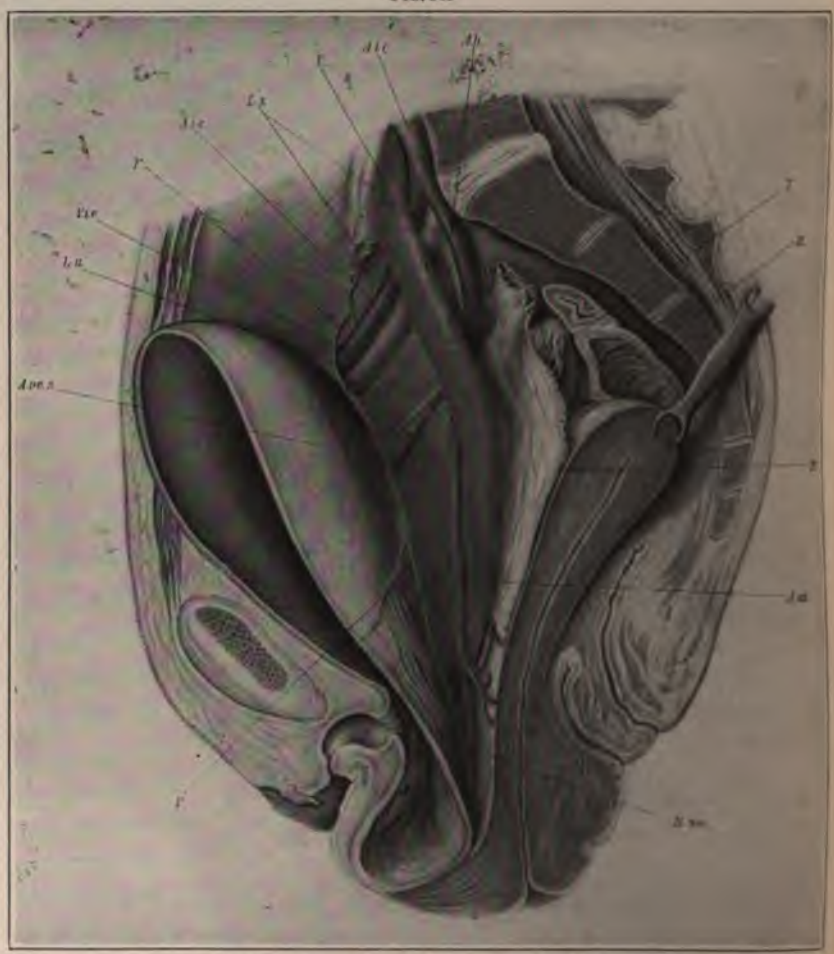


Topography of bladder and ureters in cystocele as shown by sagittal section: *A.h.*, hypogastric artery; *A. i. e.*, external iliac artery; *C. d.*, Douglas' pouch; *C. v. u.*, vesicouterine pouch; *Cy*, cystocele; *L. s.*, infundibulo-pelvic ligament; *Po.*, portio vaginalis; *R.*, rectum; *T.*, Fallopian tube; *U*, ureter; *Ua.*, urethra; *Um.*, ureteral orifice; *Ut.*, uterus; *Ve.*, bladder. (Tandler u. Halban.)

Treatment.—The treatment depends upon the nature of the injury and of its complications. Rest in the recumbent posture may be sufficient if the ureter is not perforated or occluded or does not slough, though the local application of heat or cold may be required for pain. Should perforation occur an incision through the loin, flank, or vagina, as needed to reach the injured point, should be made at once and the

ureteral injury repaired if possible or drainage to the surface be secured. If the peritoneal cavity has been invaded by urine it should be washed out and the opening closed. If occlusion with perforation be present then the injection as suggested by Kollischer may be employed. Even

FIG. 341



The same as Fig. 340, with further exposure of the ureter: *A.h.*, hypogastric artery; *A.i.c.*, common iliac artery; *A.i.e.*, external iliac artery; *A.ut.*, uterine artery; *A.ve.s.*, superior vesical artery; *L.s.*, infundibulo-pelvic ligament; *L.u.*, lateral umbilical ligament; *P.*, peritoneum; *R.*, rectum; *R. Va.*, vaginal branch of uterine artery; *T.*, Fallopian tube; *U.*, ureter; *V.i.e.*, external iliac vein. (Tandler u. Halban.)

the passage of a bougie may loosen the clot or open a way through the obstruction and the case be watched for developments. Should it prove insufficient an extraperitoneal incisional exploration is required. Should sloughing of a portion of the ureter occur, the diseased part must be

removed and some of the methods of disposal of the urine employed. Whenever possible union of the two ends is highly advantageous.

FIG. 342

The same as Fig. 341, at a lower plane, showing prolapse of right ureteral orifice. (Tandler u. Halban.)

(*c*) **Injuries Due to Surgical Accidents, Parturition, Etc.**—These are, practically speaking, ligation, punctures, or slits in the ureter, partial or complete transverse section, resection, removal of a portion of one side, and fistula. Punctures and slits, often not discovered at the time produced, result from applying the cutting edge or point of scissors, knives, and needles. Anatomical abnormalities of the ureter act as a cause. If the lower portion is double one branch may easily be surrounded or punctured by a ligature placed for removal of a uterine appendage. In vaginal hysterectomy this accident is common, as is complete section of a ureter or pinching of it with an artery forceps or a clamp. The abdominal route is less productive of such injuries. In obstetrics ureterovaginal fistula occasionally occurs from prolonged labor caused by impaction of the presenting part for a long time and violent application of forceps. In removing large tumors from the abdomen or broad ligament a portion of the ureter may be included. Removal of a portion of one side of the duct by scissors is by no means an uncommon accident.

Symptoms.—Ligation of both ureters will cause total suppression of urine and give rise to severe pain in both loins, where the tumors of distended upper ureters will be felt. The symptoms of urinary suppression will supervene. Ligation of but one ureter will not have a similar effect unless the kidney of the opposite side is silent. Otherwise the urinary excretion will be decreased one-half until the back pressure of pent-up urine on the affected side equals the renal arterial pressure. At that point the healthy side will be furnishing a notably increased quantity of urine. In punctures urinary leakage may occur for a short time, but if the ureter and urine be normal the slight leakage will be harmless and the puncture will close promptly. If the urine be infected it is apt to produce septicæmia or abscess. If a paring be taken from the side of a ureter, hernia may occur, and if the wound penetrate the calibre of the duct severe leakage result with peritonitis if the peritoneum be perforated. In transverse division, partial or complete, the symptoms depend largely upon whether the duct is ligated above the injury and whether the wound is sufficiently small to permit some urine to pass into the bladder. With the lumen of the duct opened in a transverse injury leakage is bound to occur, as the tendency of the wound is to widen rather than the opposite and nature will not heal it. If the duct is not ligated the tissues about the ureteral wound will be infiltrated in a short space of time and the evidence of the presence of a localized soft mass with decreased elimination of urine that may contain blood will be present. Localized pain and extreme restlessness of the patient are prominent symptoms. If a vaginal operation has been done, or drainage through the incision of an abdominal one used, when the injury was caused, then the urine leaks away through it and the suffering and tumor are absent. The leakage becomes readily troublesome to the patient and the character of it understood.

Diagnosis.—Evidence of leakage from the ureter after a surgical operation is based upon increased discharges having characteristics

PLATE LIX.

Figure 1. Cystitis Originating in the Trigone and Extending to Adjacent Surfaces. Magnified. (Dudley.)

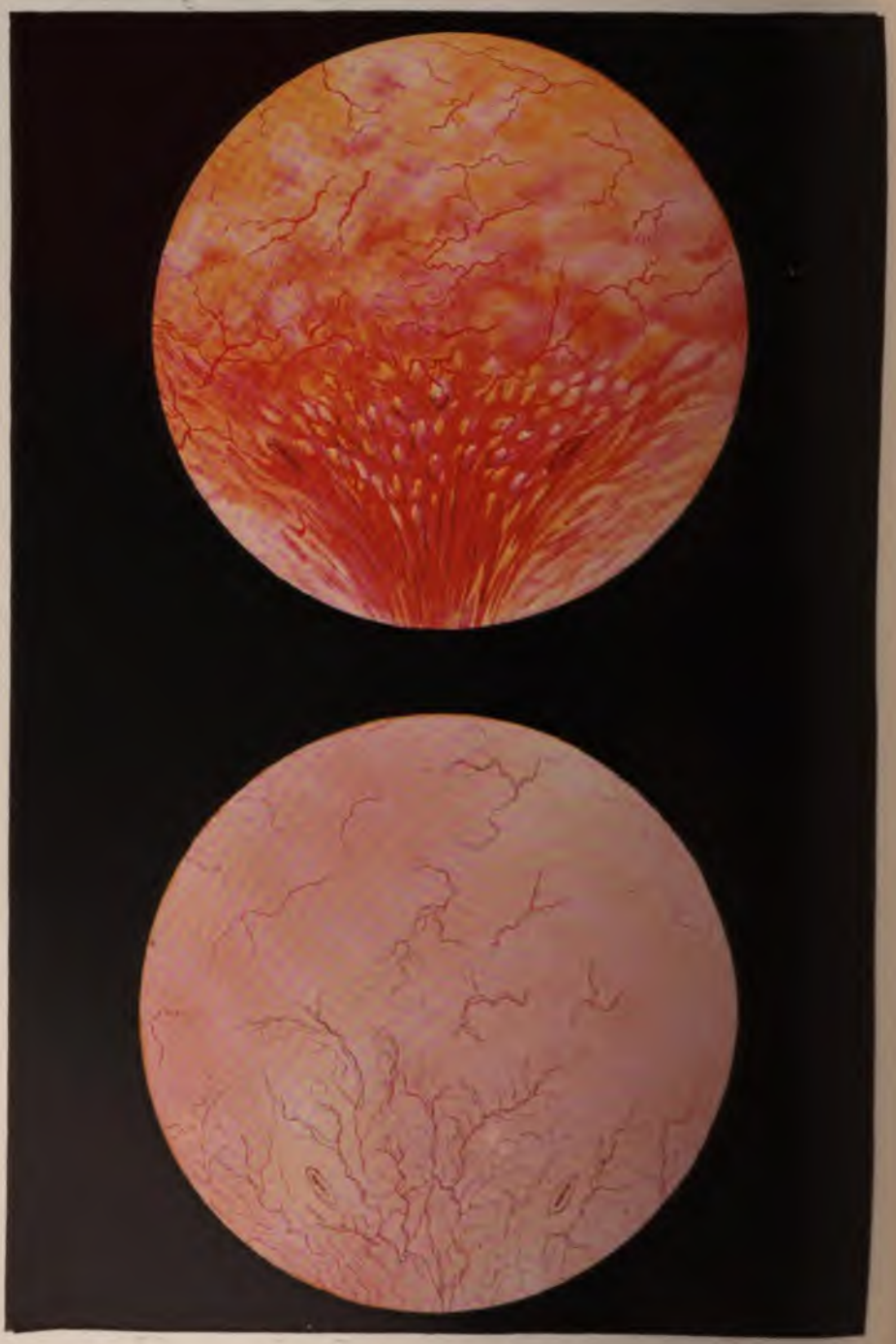


Figure 2. Normal Bladder Mucosa. Slightly magnified. (Dudley.)

PLATE LX.

Figure 1. Linear Ulcer of Bladder Mucosa. Magnified. (Dudley.)

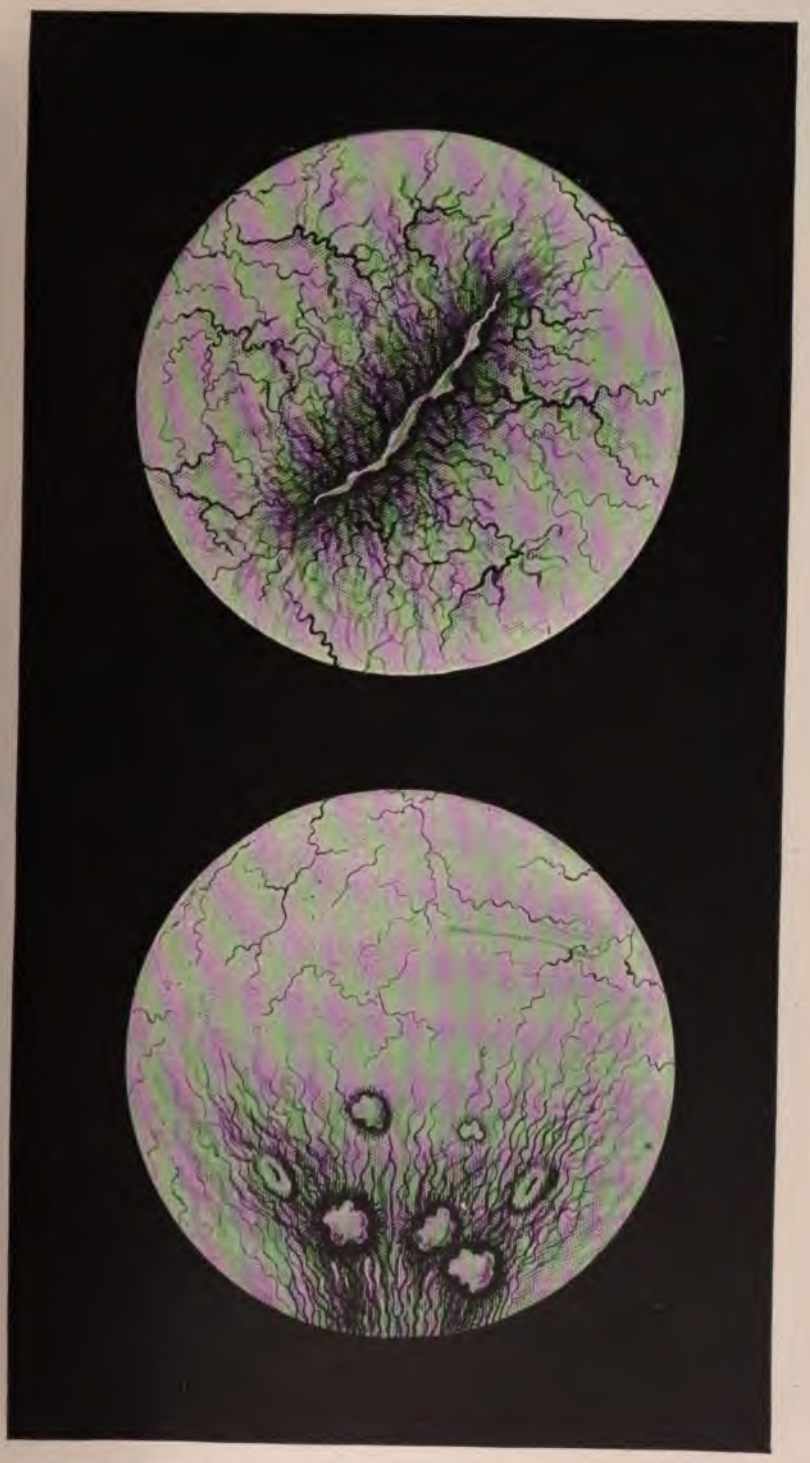
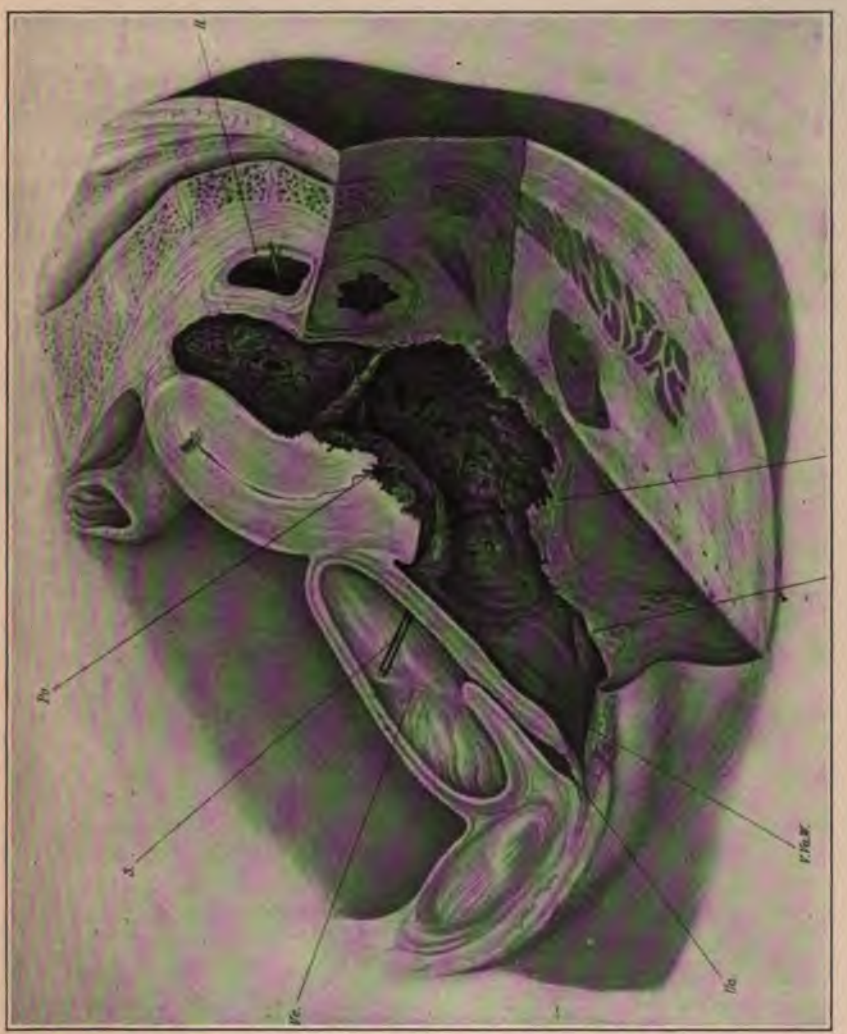


Figure 2. Ulcerated Patches in the Trigone. Slightly magnified. (Dudley.)

of urine through the dressings when drainage is employed. If no drainage is used it may be pent up, when the diagnosis is based upon evidence of infiltration, lessened amount of urine by the normal passage,

FIG. 343



Ureterovaginal fistula from cancer of the cervix uteri: *H. Va. W.*, posterior vaginal wall; *Po.*, portio vaginalis attacked by cancer; *R.*, rectum; *S.*, sound in the ureter; *U.*, ureter; *Ua.*, urethra; *Ve.*, bladder; *V. Va. W.*, anterior vaginal wall. (Tandler u. Halban.)

and such constitutional disturbances of the patient as restlessness, increasing fever, and pulse rate. If the leakage is into the peritoneal cavity peritonitis may be caused. Complete ligation or complete

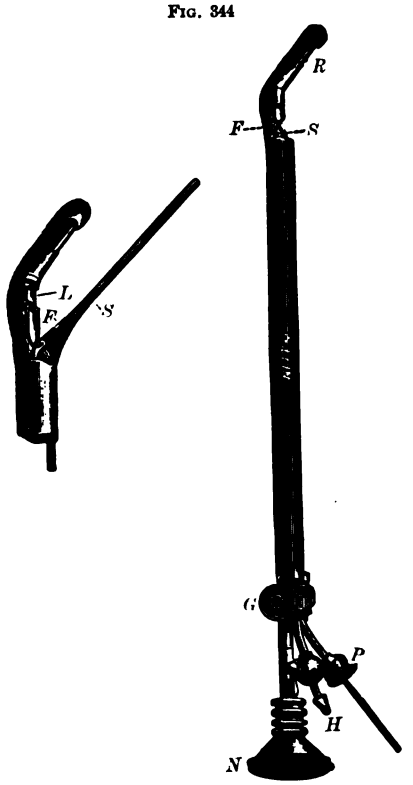
transverse division of both ureters is to be differentiated from urinary suppression from other causes by its occurring at an operation and by evidence of accumulated urine in the urinary passages above the ligature or in the tissues near the field of operation that may find an outlet through the operation wound. When on one side alone, the diagnosis depends on a diminished flow of urine for the first few days, and pain, practically limited to the affected side, accompanied by restlessness incident to the interference with the normal elimination of urine. Later when the fellow-kidney becomes competent to increase its work of elimination the pain decreases, but more or less swelling above the ligature remains in the crippled ureter. If it is severed and not ligated the diagnosis depends as well upon the evidence of urinary infiltration and, perhaps, leakage through the operation field. Unknown resection of a ureter may be discovered before the end of the operation during which it occurred. It will be known by the presence of urine in the field of operation while the bladder is uninjured, or by the presence there of the opening of a patulous thick-walled vessel, from which no blood escapes and which immediately impresses the surgeon as being one unfamiliar to him. If it is the renal end and not ligated, urine may possibly be escaping in small jets and a probe will pass well up in it. If it be ligated, a probe will not pass and removing the ligature allows escape of urine, when the kidney is functionating, and passage of the probe. If it be the lower end, nothing will escape and a probe in it may be passed to the bladder across the uterine vessels. A careful examination of the removed structures will usually show the piece of the ureter. It was such examination that first aroused suspicion in some of the reported cases. In no other way can unknown resection be recognized with certainty after the wound is closed.

The diagnosis of ureteral fistula is made by studying the abnormal urinary passage by injecting colored water into the bladder that fails to return through the fistula and a consideration of the probability of whether the bladder or a ureter was most apt to be injured in the operation, tedious labor, etc. In some cases in which the leakage is about as much as passes through the bladder, a ureteral catheter may be introduced into the sound ureter and no change be noted, but when put by the fistula on the affected side the leakage stops promptly. Cystoscopy in such a case, too, shows none or practically no urine escaping from the orifice of the affected side. Later in the history of ureterovaginal fistula the same points may guide in reaching a diagnosis. A probe in the false urinary passage, however, is of little value. In one case for which I did ureterocystostomy through the kind invitation of T. A. Reamy, of Cincinnati, a probe passed upward along the track, entered a small pocket behind the right adherent ovary, into which a fistula from the severed left ureter emptied. The right ureter was intact.

Treatment.—Urinary extravasation is the most important complication calling for prompt action. It requires an extraperitoneal incision and drainage when the retroperitoneal tissues are invaded. Sometimes the

original wound may be reopened satisfactorily. When the escape is into the peritoneal cavity, cul-de-sac drainage, with perhaps peritoneal flushing, is best. If the condition of the patient admits, prompt effort to stop the leakage should be made, though free escape of urine may safely continue for a considerable time and a more careful and leisurely operation be done subsequently. Ligation of one or both ureters should not be allowed after its detection. A urinary fistula is far preferable to a kidney with suspended function.

FIG. 344

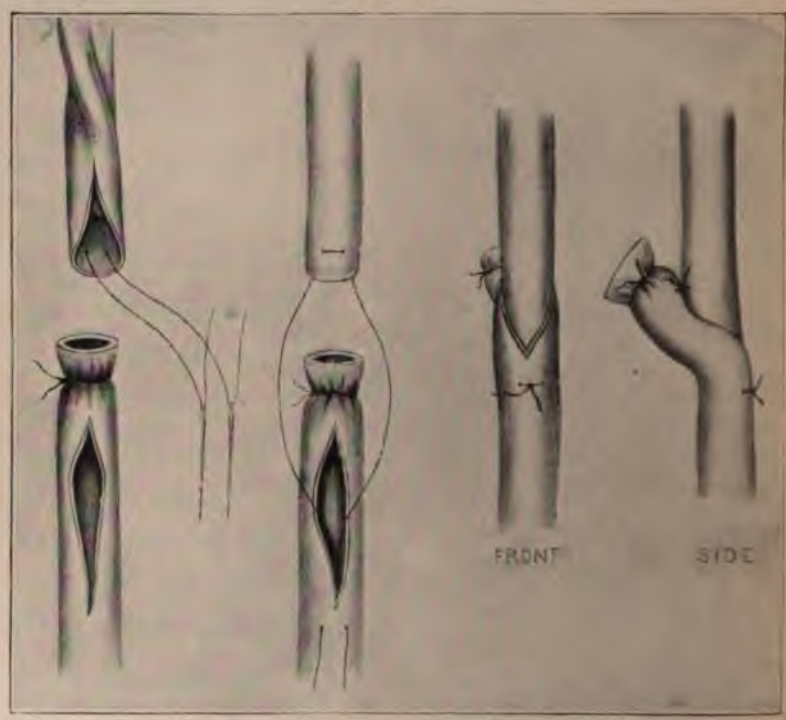


Cystoscope for ureteral catheterization: *L*, light; *R*, reflecting prism; *F*, spur for raising tip of catheter; *S*, catheter; *P*, opening through which catheter passes; *O*, cap of tube through which catheter is introduced; *H*, tube with stop-cock; *M*, for irrigation; *N*, eye-piece; *G*, screw for regulating spur *F*.

The question of what will be done with the ureteral wound depends upon the character of it. If it is a small puncture or a short longitudinal incision or a transverse or oblique wound, involving not more than two-thirds of the diameter, one or more very fine sutures of catgut passing through the ureteral walls, excepting the mucosa, will suffice. Complete division will require ureteroureteral anastomosis, ureterocystostomy, or ligation of the upper portion of the duct. This latter procedure, however, should have no place in the domain of modern ureteral surgery. If a portion of the ureter is lost grafting of the upper

portion into some neighboring structure for disposal of the urine should be attempted. By far the most preferable is union of the separate ends. If the wound is in the lowest two inches bladder implantation is the best substitute available, and in the abdomen implantation into the opposite ureter is the best alternative for it. Implantation into the colon or rectum or on to the skin are less valuable substitutes. Mauclaire and Gersuny have devised a plan for utilizing the bowel for a sphincteredurinary reservoir, into which ureters may be implanted, and others have experimentally proven that a section of intestine may be sequestered and used as a reservoir for urine.

FIG. 345



Van Hook's method of ureteroureteral lateral invagination.

The ureter ends may be satisfactorily approximated when at least two inches have been sacrificed and sufficient depression of the kidney to compensate for two inches more has been experimentally proven by the author.

OPERATIONS ON THE URETER.

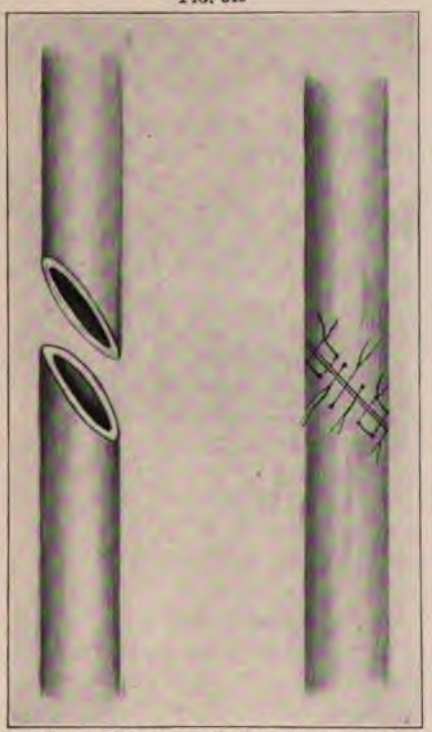
These are principally ureterotomy, ureterolithotomy, ureteroureterostomy or ureteroureteral anastomosis, ureterocystostomy, pyeloure-

terostomy, ureterocolostomy, ureterocolpostomy, dermoureterostomy, ureterocleisis, and ureteral dilatation for stricture.

Ureterotomy.—Ureterotomy, a term signifying cutting into the ureter, is usually done for purposes of exploration or to facilitate some other surgical operation upon the duct. A longitudinal slit about one-half inch in length is made into the lumen of the ureter and sutured when no longer needed.

Ureterolithotomy.—Ureterolithotomy is ureterotomy with extraction of a calculus. The wound may or may not be sutured according as the wall of the duct is normal and free from infection.

FIG. 346

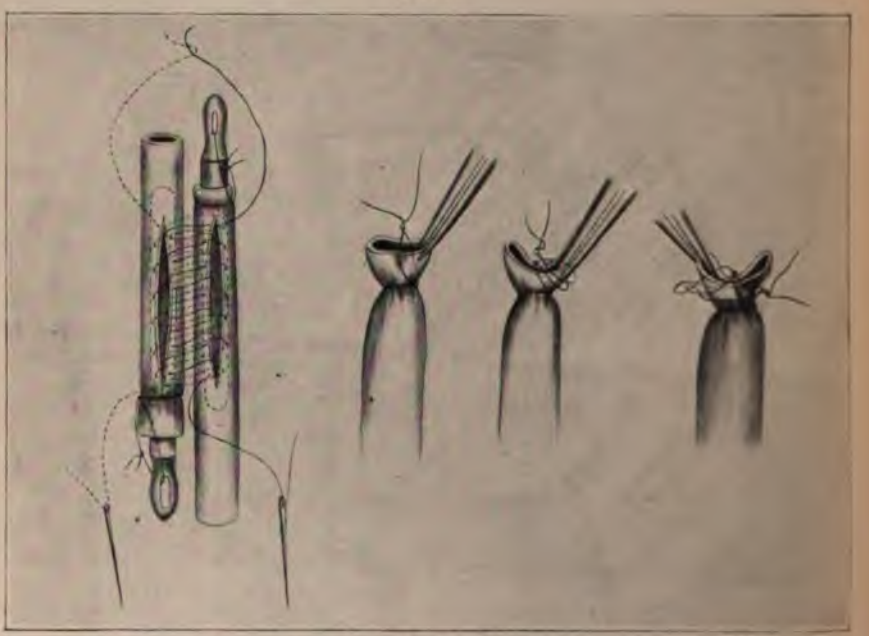


The author's oblique end-to-end method of ureteroureteral anastomosis.

Ureteroureteral Anastomosis.—Ureteroureteral anastomosis, an operation first done in 1886 by Schopf, and performed fully fifty times since, consists in uniting the two cut ends of a ureter so as to continue the function of the duct. The five methods by which it is done are known as the end-in-end, the transverse end-to-end, the oblique end-to-end, the end-in-side, and the side-to-side. The end-in-end method, worked out by Poggi on animals, consists in invaginating the upper segment into the lower and holding it there by sutures. This is done by passing

a few fine catgut or kangaroo tendon sutures through a small part of the wall of the upper segment about one-fourth inch from the end without penetrating the mucosa. The two ends of each suture are then passed closely together from within outward through the whole thickness of the lower segment about one-half to three-fourths of an inch from the end. When all are placed the upper segment is invaginated by pulling on the sutures and the sutures are tied. A few other fine catgut sutures unite the cut end of the lower fragment and the invaginated portion. A modification of this method, done first by A. W. Mayo Robson, consisted of splitting slightly the lower stump.

FIG. 347



D'Urso's and De Fabii's adaptation of Monari's method of lateral anastomosis of ureter.

The transverse end-to-end, the most commonly practised, is done by suturing the two divided ends together, the interrupted sutures not penetrating the mucosa. Two rows are put in to secure firm union. A small piece of catheter may be placed in both fragments to fix the parts while applying sutures. Kelly has devised a small metal instrument to be introduced through another opening a short distance from the field and removed after the sutures are tied.

The oblique end-to-end method devised by myself is performed by cutting the ends obliquely and then suturing them, as in the transverse method. It is planned to prevent subsequent constriction, an objection that has been made to the end-in-end and end-in-side, as well as the transverse end-to-end operation.

The end-in-side plan of Van Hook consists of ligating the lower end and making a slit, 1 cm. in length in this portion, beginning 0.5 cm. below the ligature. Through this opening is drawn the upper cut end by means of sutures passed outwardly through the wall of the receiving end of the ureter, 1 cm. below the incision or 2.5 cm. below the ligature. The operation loses 4 cm. of the ureter. When the upper end is dilated, as was Emmet's case, more of the length must be utilized.

The side-to-side method, devised by D'Urso and De Fabii, is done the same as in lateral intestinal anastomosis—*i. e.*, by ligating both cut ends, making a slit in each ureter of equal lengths and suturing the edges of the two slits so as to leave a passage between the lumens of the two portions.

The skilful surgeon will find the transverse end-to-end the preferable method, and next comes the end-in-end, though the others have their advantages as to firm union.

Ureterocystostomy.—This operation, created and employed by Tuffier in 1877, has since been performed 111 times. It is done by the intraperitoneal, the transperitoneal, and the extraperitoneal routes. In some cases it may be done by the vaginal route, though success by this route is not so promising. When this route is employed it is for ureterovaginal fistulæ resulting from parturition or for abnormal congenital ureter exits. By the abdomen the choice of routes depends largely upon the location of the injury, the condition of surrounding parts, particularly as to adhesions, and principally the condition of the urine as to innocuousness. Whenever the extraperitoneal route can be used it should be, as it is safest. Even though the intraperitoneal method is used, the peritoneum should be drawn over the point of union. The implantation should be as oblique as possible to imitate the natural junction. The best method of implantation is that of Paoli and Busachi. A slit in the bladder, three-fourths of an inch in length, is made along the side near the top of it and the ureter is sutured to the whole length of it after the end of it has been anchored, as to be described. The end of the ureter is split an inch on two opposite sides and each flap sutured to the inner side of the bladder beyond the slit by absorbable sutures passed completely through the flap and bladder wall from within and knotted on the outside. The sutures uniting the bladder incision about the ureter should avoid the ureteral mucosa.

Van Hook and Kelly have devised methods of carrying the bladder upward to meet the ureter when the part to be implanted did not reach to within three inches of the bladder junction.

Pyeloureterostomy.—Pyeloureterostomy is an operation consisting of reuniting the pelvis to the rest of the ureter when the pelvis has been dilated by urine as a result of angulation, or a valve-like constriction in that vicinity. Küster's plan is to sever the pelvis from the less-dilated portion of the duct and by splitting the end of the lower portion and rounding the right angles thus formed and suture it to the pelvis. The lower portion when sutured has outlines similar to the panhandle. Fenger and Mynter have applied the Heinecke-Mikulicz method of

suturing, which is to make a short longitudinal slit dividing the constriction and then, by gaping the wound the widest possible, insert sutures so as to make the line of union transverse, thus bringing into coaptation the ends of the incision in the middle of the line of union. These operations give brilliant results, as I have found from both methods.

Ureterocolostomy.—This operation of implanting a ureter into the colon or rectum is done by five different methods—viz., (*a*) by the formation of a fistula between them; (*b*) by the axial implantation of the ureter stump into the bowel and its fixation there by means of the Lembert or the double-row sutture; (*c*) implantation of both ureters with a piece of the bladder, as done by Maydl; (*d*) implantation of both ureters and more of the bladder mucosa, as practised by Pozza and other Italian surgeons; and (*e*) by means of anastomotic buttons, such as those devised and employed by Chalot and Boari. Much study has been made of this operation on account of the high mortality from ascending infection. The Maydl and Pozza methods are very much superior to all others, as the immediate and ultimate results are very much better. This operation can scarcely ever be employed except in exstrophy of the bladder or complete extirpation of it. Even then in women vaginal implantation will probably be safer than any method of bowel grafting except those of Maydl and Pozza.

Ureterocolpostomy.—Ureterocolpostomy is uniting the vagina and ureters, a plan adopted by Pawlik in his first successful urinocystectomy. Mann, of Buffalo, has two or three times employed it in similar cases. It leaves a urinary leakage that is very unpleasant unless the vagina is closed, as was done in Pawlik's case, and in which self-catheterization was practised.

Dermoureterostomy.—Dermoureterostomy, suturing the ureters to the skin, is a hazardous procedure, as it readily admits of ascending infection. Probably every case in which it was done has ended in that manner.

Ureterocleisis.—Ureterocleisis really means closing small openings in the ureter, such as ureteral fistulæ, or complete closure of its lumen, which should have no place in surgery.

Ureteral Dilatation.—Ureteral dilatation for stricture is practised by introducing graduated ureteral bougies through a cystoscope. It is a tedious method of treatment but fairly successful. It requires much skill and a very careful technique.

CHAPTER XXIX.

AFFECTIONS OF THE BLADDER IN THE FEMALE.

By J. WESLEY BOVÉE, M.D.

THE bladder is a thin-walled viscus composed of muscular and fibrous tissue, covered in part by peritoneum, and lined by mucosa and embedded in the pelvic connective tissue. From its close relation to the genital tract and the intestine it is especially subjected to invasions of micro-organisms from those structures. The kidney, ureter, and urethra in addition furnish primary causes for maladies of the bladder. Its different structural layers are involved in the various affections of the organ.

Its functional activity renders it particularly prone to disease from interference or embarrassment of its function resulting in urinary changes. Syphilis or cancer, involving the vagina or cervix, readily extend by contiguity into the bladder.

CONGENITAL DEFECTS.

Double Bladder.—When the right and left portions of the allantois fail to fuse in early fetal life this condition results. But few cases have been observed. Usually an anteroposterior membranous septum is found that in front divides the internal urinary meatus so that each bladder has an outlet into the same urethra and each has but one ureter supplying it with urine.

Modifications, such as double urethræ and a small perforation through the septum, have been noted. This latter, exaggerated into the existence of trabecula, is more common.

Loculate Bladder.—Congenital pockets are quite common and probably result from developmental defect in fibrous and muscular structure of the bladder.

Exstrophy of the Bladder.—This condition, known as ectopia vesicæ, or eversion of the bladder, from a fissure in or absence of the anterior bladder wall, is quite common, particularly in males. It is usually associated with a cleft in the pubic arch and absence of structures in front of the bladder, and is due to a failure of the abdominal laminæ to unite in early fetal life.

Other abnormalities are often seen accompanying exstrophy, especially in girls. Among these are absence of the urethra and absence or arrested development of the uterus and appendages.

This condition not only causes mortification and semi-invalidism from constant discharge of urine, but in case of pregnancy may cause

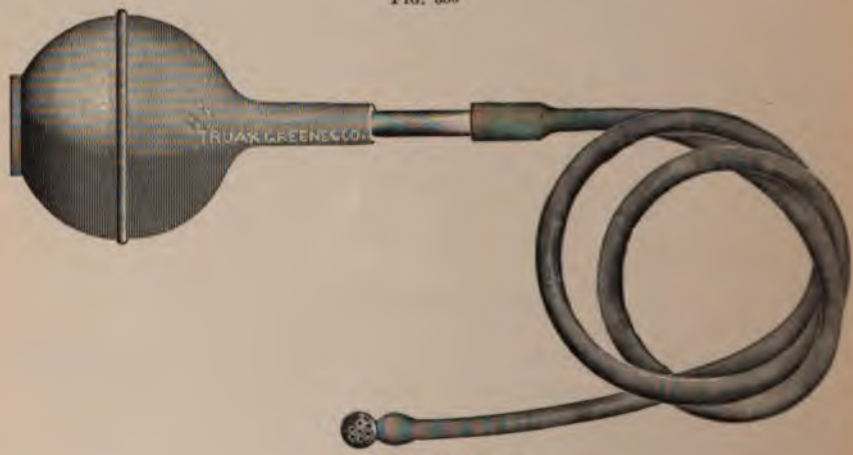
FIG. 348

A graduated calibrator.

FIG. 349

Soft ureteral catheter.

FIG. 350



Evacuating apparatus.

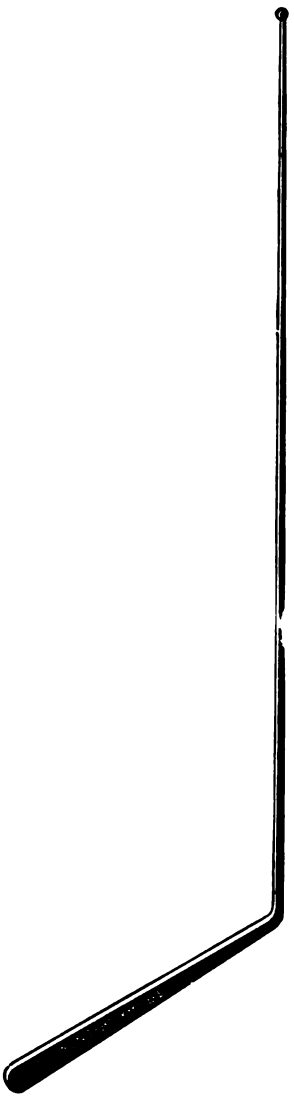
FIG. 351

Soft ureteral catheter with rubber tube attached for collecting urine.

tedious and ineffective labor, owing to lack of compression by the abdominal muscles. Malignant degeneration of the ectopic bladder may occur.

Treatment.—Various plastic operations have been devised and used for closure of the cleft and to secure control of the flow of urine. In

Fig. 352



Ureteral searcher.

Fig 353

Silver ureteral catheter.

Fig. 354

Delicate mouse-toothed forceps.

Fig. 355

Metal ureteral catheter.

mild cases these have succeeded. With the defect situated high and involvement of the genitals, pubic arch, and urethra, careful funnel-shaped denudation of the opening and transverse approximation with

FIG. 356

Cystoscope. (Kelly.)

good suture material may result in its complete closure. Urethral drainage is a necessity while union is forming. Where the opening is larger the skin of the abdomen surrounding it may be carried in over it

without inversion and sutured, though the complete closure be not secured by the first attempt. Sonnenburg's operation of uretero-urethral grafting, when applicable, is a valuable procedure, the cleft being filled in by transplantation of the surrounding tissue at a subsequent séance. When the urethra is absent nothing will succeed but

FIG. 357

Same as Fig. 356 (smaller size).

FIG. 358

Same as Fig. 356 (still smaller size).

some form of ureteral implantation, with closure of the defect. The best of these is probably the Pozza method of intestinal graft, and next to that comes the Maydl operation, which makes use of less of the bladder wall than Pozza's method.

FIG. 359

Hand holding cystoscope in act of introduction. (Kelly.)

FIG. 360

Dorsal position. Elevated pelvis. (Kelly.)

FIG. 361

Knee-breast position. Cystoscope introduced; sound shows position of anal orifice. (Kelly.)

FIG. 362

Showing side view of Fig. 361.

By these plans the danger of infection travelling from the intestine to the kidney is much lessened.

Vaginal implantation does not remove danger of ascending renal

FIG. 363

Cystoscope.

FIG. 364

Harris' urine segregator.

FIG. 365

The same in position.

infection nor does it end urinary leakage, though Pawlik did close the vagina, and, suturing the urethra to the vagina, secure retention with emptying by catheterization.

FOREIGN BODIES IN THE BLADDER.

Foreign bodies in the bladder are not uncommon and reach that location through the urethra principally. They may be introduced through the ureter, a vesicovaginal fistula, or ulcerate through the vaginal septum, or other portions of the vesical wall. A not uncommon source is silk ligatures used on the broad ligaments or other portions of the pelvic fascia, that later slough into the bladder and become encrusted with phosphates. Suture material that penetrates the vesical or ureteral mucosa readily become similarly encrusted. Various materials are introduced through the urethra. Among these may be mentioned whole and broken catheters, hairpins, lead-pencils, toothpicks, and crochet needles. Through the vaginal walls may penetrate pessaries, and from the peritoneal or subperitoneal sides fetal bones in disturbed ectopic pregnancy and the contents of dermoid and hydatid cysts.

Symptoms.—Such foreign substance causes irritation and inflammation of the bladder, which usually increases until encrustation occurs, when the usual symptoms of bladder calculus are presented. Suprapubic pain with frequent desire to urinate are common symptoms. Soon pus and, perhaps, blood are noted in the urine. Sharp or long slender bodies tend to ulcerate through the bladder walls before marked encrustation occurs.

Diagnosis.—The presence of a foreign body in the bladder can often be detected by bimanual palpation, and if this fails the passage of a sound through the urethra into the bladder will aid such examination materially.

Inspection by means of the cystoscope will remove its presence unless it be free and very small. In that event it might possibly elude detection.

Treatment.—The proper treatment is removal of the foreign body, which is most harmlessly done through the dilated urethra. Should the shape, size, or other feature of the foreign body cause abandonment of that route, then vaginocystostomy should be employed. There may be cases in which this operation is contraindicated by reason of virginity, absence of vagina, or cicatricial anterior vaginal wall, and suprapubic cystotomy is required. If, after extraction by these latter-mentioned routes, the bladder is much infected, careful drainage per urethra should be instituted. Even when extraction per urethra has been made irrigation should be practised. In one case I found that after hysterectomy for uterine fibromata a vesical calculus had been mistaken for a low fibroid. The calculus was removed at once transperitoneally and the wound closed. This route should not be recommended, but under the conditions it was the most rapid procedure which seemed important. Vaginal drainage for days was employed and recovery was uneventful.

INJURIES OF THE BLADDER.

In parturition the bladder is subjected to traumatism from pressure of the impacted fetal head, and from unscientific use of obstetric forceps. Other traumatic injuries from without are produced by forceful contact with too sharp objects or even blunt ones—such as falling long distances or missiles thrown with great velocity. Medical literature contains many interesting cases of falling down precipices, being gored by goats and bulls, and falling from a load of hay on the end of a pitchfork handle. During operations on adjacent organs the bladder may be injured. From the first-mentioned cause the bladder puncture usually is not demonstrated until after sloughing of the parts for a few days has occurred. From all the others the result is apparent at once.

Symptoms.—If there is a history of fall or severe traumatism to the pelvis or the application of a compressing force to a distended bladder, followed by more or less collapse, with inability to micturate, wound or rupture of the bladder should be suspected. A catheter passed into the bladder brings but a little bloody urine or blood. A weak solution of boracic acid injected into the bladder does not raise that organ above the pubes and does not all return by catheter.

Diagnosis.—Bladder injuries, when extraperitoneal, are readily recognizable by the escape of urine, either through the vagina or extravasation into the surrounding cellular tissue which gives rise to tumefaction, the passage of a decreased amount of urine that is bloody, moderate fever and localized pain.

When intraperitoneal rupture has occurred, the tumefaction of extravasation is replaced by peritonitis, the degree of which depends upon the character of the urine invading the peritoneal cavity.

Treatment.—If intraperitoneal rupture has occurred the bladder wound should be promptly closed by the transperitoneal route, the peritoneum cleansed, and drainage instituted.

If cellular extravasation has occurred, then thorough drainage with repair of the bladder should be done promptly. If the injury be on the side it may be repaired at once. If it be of the sloughing variety, time enough for thorough definition of the full extent of the sloughing should be allowed before attempt at repair is made. In any case bladder drainage becomes a necessity.

CYSTITIS.

Cystitis, or urinocystitis, to be exact, is inflammation of the urinary bladder. It may be acute or chronic, the latter being a sequel of the former. Acute cystitis may be caused by infection from the urethra or ureter. Rarely is the bladder infected through the blood channels. It may be localized or invade the whole mucosa of the viscus, but it rarely ever invades deeper structures.

Catheterization and other instrumentation of the bladder, the presence of foreign bodies and ureteral calculi introduced into it cause this condition. Occasionally operation wounds, or injuries of the organ, lead to acute cystitis.

The chronic form is usually the result of neglect of an acute attack or of urinary obstruction along the urethra. It is characterized by marked infiltration of the muscular, submucous and mucous coats, with notable exfoliation of the latter.

Symptoms.—Acute cystitis gives rise to cutting and darting pains through the bladder, accompanied by frequent and painful micturition of urine having marked acidity and containing an unusual amount of mucus, pus, and, perhaps, some blood. In a short time pus appears and neutral urine is noted.

The temperature may rise to 102° or 103° and the patient appear alarmed and exhausted. In chronic cystitis the temperature is rarely normal, being usually as high as in the acute form. The tenesmus may or may not be a marked feature. The urine is usually loaded with pus, flaky deposits, blood, and alkaline encrustations. From stagnation in many cases the urine becomes alkaline. The bladder capacity is likely to become markedly lessened, reaching in some cases a maximum of three ounces. The mucosa is dark red in color, as seen by the cystoscope, but commonly variable in degree at different points.

Diagnosis.—The diagnosis of cystitis, either acute or chronic, is not difficult. In the acute form the characteristics of the urine, together with the localized symptoms already mentioned, should be sufficient to exclude such conditions of the urinary structures, as ureteral calculus or new-growth, tuberculosis or ureteral calculus, and various kidney lesions. The chronic variety is usually determined by the thickness of the bladder wall as found upon palpation, the history of a prolonged local affection, perhaps beginning with acute cystitis, the presence of alkaline, flaky urine, loaded at times with debris, and the advanced age of the sufferer.

Treatment.—This consists in acute cases of complete rest in bed, free dilution of the urine by large quantities of water and demulcent drinks. The administration of such sedatives to the urinary tract as buchu and hyoscyamus and urinary antiseptics, as cystogen, assist materially. Rarely in acute cystitis will bladder irrigation be required.

For this purpose boracic acid, acetozone, and glycothymoline I have found the most efficient of drugs.

Hot vaginal and rectal enemata are of great value, as are suppositories of belladonna, hyoscyamus, and morphine. Counterirritation over the bladder often affords much relief from the pain and bladder tenesmus. In the chronic variety of cystitis bladder irrigation is a necessity. It should be employed as frequently as the patient's condition indicates. Usually one to three times daily is sufficient, and acetozone, potassium permanganate, and the silver salts are most useful for this purpose. The parts should be kept at rest. For this purpose permanent drainage by catheter or cystotomy fistula may be required. In acute cystitis

nitrogenous food, condiments, and alcoholic and genitourinary stimulants should be restricted or absolutely forbidden.

In any event a cause for cystitis should be sought and, if possible, removed.

TUMORS.

These may be classified according to the coat from which they spring as follows: From the muscular tissue, myomata; from the glandular tissue and epithelium, adenomata and epitheliomata, and from the connective tissue of the mucosa and submucosa, papillomata, fibroid polyps, sarcomata, and mucous polyps.

FIG. 366

Simple villous papilloma. The pedicle is slender and the base uninfiltrated.

Tumors of the bladder, however, may be secondary to growths, particularly malignant, in other organs as carcinoma of the cervix uteri. The principal tumors found in the bladder wall are the benign variety consisting of the benign papilloma, the fibroma, the fibromyxoma, the malignant papilloma, and varieties of carcinoma and sarcoma. By far the most frequently occurring is the benign papilloma. Of 135 operations for bladder tumors done by Fenwick, 95 were for benign papilloma, 27 for epithelioma, and 13 for carcinoma, with 3 unclassified. It is a curious fact that nearly all bladder tumors penetrating the cavity of that viscus are covered more or less by villi, although the presence of the villi in the mucosa has not been proven conclusively.

Papillomata spring from the superficial layer of the mucosa and develop into red vascular masses of different sizes.

E. Harry Fenwick, in his monograph "Tumors of the Urinary Bladder," has expressed the conviction that multiple or large papillomata are always malignant. He says "bulk seems more to depend upon tendency to slow carcinomatous change; at least all the very large papillomata I have removed have been reported upon by the microscopist as possessing suspicious characters of malignancy."

As Mr. J. H. Fargett has done practically all of his pathological work, its reliability should be unquestioned.

Benign Villous Papilloma.—The benign villous papilloma is usually developed about a ureteric orifice, though secondary ones may develop in other portions of the bladder mucosa when malignant degeneration has ensued. The villi or processes are often very long and slender, having delicate long, leaf-like projections of a light fawn color, and diversified by the capillaries permeating them.

FIG. 367

Villous papilloma of bladder wall situated near ureteral orifice.

They float freely in the bladder and may plug the urethra effectively, causing urinary retention with its attendant evils, hemorrhage from injury to its delicate tissue, and ureteral regurgitation by traction on the ureteral orifice about which it has its attachment. The last is the most important complication of the benign villous papilloma, inasmuch as it leads to renal infection with its attending evils.

The pedicle is oftentimes remarkably small, even when malignancy at the base is present. A papillomatous mass an inch in diameter may have a pedicle a thirty-second of an inch in diameter.

On account of their unusual fragility they may produce severe hemorrhage, sometimes to the extent of exsanguination.

The bladder may be found distended by blood, proper emptying of the ureters being thus prevented. Bladder irrigation and exploration

exaggerates the state by increasing the blood loss, even though the bladder be temporarily emptied. About half the cases begin to have symptoms between the age of thirty and forty years. The percentage decreases both ways from that period of life.

Symptoms.—Rarely is any evidence of bladder disease manifest before hæmaturia is noticed. This may vary in amount from a few drops noticed at the end of micturition to profuse hemorrhage sufficient to

FIG 368

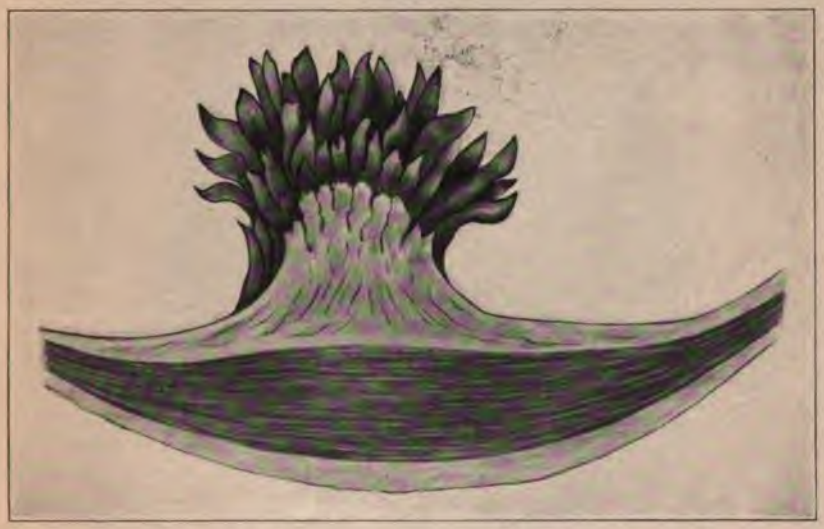
Benign villous papilloma of bladder, surrounded by masses of cancer. (After Fenwick.)

distend the bladder considerably. It may occur steadily for months or may be present for a few days and not occur again for some years. It is most apt to be prolonged if the villi are caught in the urethra and squeezed. When the villi float into the urethra the patient may have the sensation of sudden obstruction of the flow of urine, and which is relieved by assuming some changed position with complete bladder evacuation.

This is produced by the villi of the growth floating to another portion of the bladder cavity. This obstruction may be so marked as to cause residual urine with bladder infection, which is allowed to pass into the ureter more easily because of the traction on the bladder wall at the ureteral orifice. Then renal pain and other symptoms of pyelitis or more severe kidney involvement is to be expected. The symptoms of pronounced anæmia or those of grave renal complication may be present in aggravated cases. When malignant degeneration has taken place other symptoms are noted and will be referred to under the proper heading.

Diagnosis.—This is based upon the age of the patient, the duration of the attack, the absence of cachexia, and of material hardening or

FIG. 369



Villous papilloma, passing into malignant papilloma, as shown by the thickened pedicle and infiltrated base.

infiltration of the bladder wall discoverable by the bimanual palpation and the presence of a tumor as demonstrated by cystoscopy or cystostomy. Even then the benign nature of the growth should be ultimately decided only by microscopic examination. Malignant tumors of the bladder appear later in life than benign ones, and, as a rule, have a longer period of development if grafted upon a benign one, or a shorter one if malignant primarily. Sometimes, however, both are present simultaneously. Occasionally pieces of the tumor are discoverable in the urine voided. Bladder palpation may discover nothing abnormal about it.

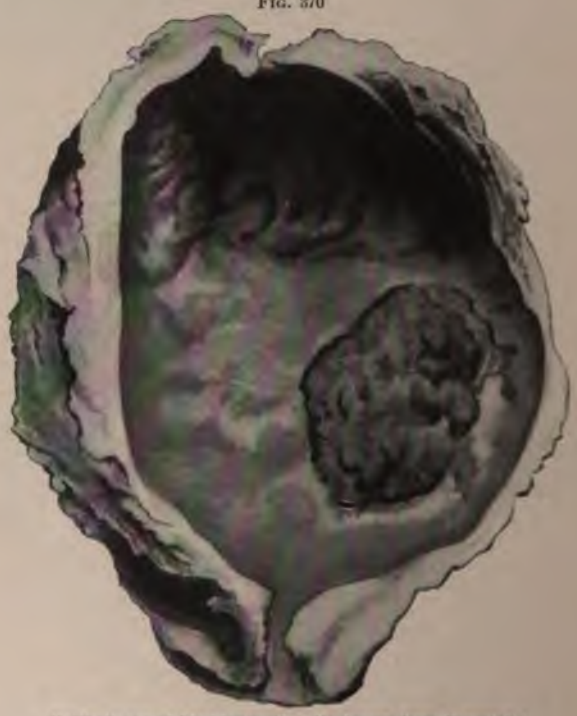
Treatment.—If a single or even two apparently benign papillomata are found in the bladder they should be removed at once, especially in the young. If multiple, and especially if reasonable doubt of benign-

ancy is present, little benefit from removal, except in emergency, can be expected. It should be done at the same sitting as the cystoscopy.

In the male the suprapubic route is the most satisfactory, and in the female urethral dilatation or vaginocystostomy will be preferred. Owing to its tendency to produce severe hemorrhage or bladder infection, bladder exploration or even irrigation should not long precede operation, but should be done at the same sitting.

Fibroma and Fibromyxoma.—Fibroma and fibromyxoma occur rarely and develop from the submucosa of the bladder. They are either sessile or pedunculated, and are covered by mucosa that is usually

FIG. 370



Epithelioma of bladder wall. (Re-drawn from Fenwick.)

villous. They never attain such prodigious proportions as do uterine fibroids.

Symptoms.—These tumors may give rise to bladder irritation before hæmaturia, especially if they impinge on the ureter or urethra. In these localities their development may lead to urinary changes and interference of function of the kidney.

Diagnosis.—This is based upon a microscopic examination. A presumptive diagnosis may be made if the patient be young, the tumor bald—*i. e.*, not covered by villi, not bleeding, and not having evidence of infiltration about its base.

Treatment.—Excision is the proper treatment for these tumors, though usually it is not so imperative as with papillomata.

Malignant Tumors.—The malignant papilloma is probably the most common form of malignant tumor of the bladder. Another is implantation of carcinoma or sarcoma into the pedicle or very base of a papilloma.

Primary cancer of the bladder is rare. Gurlt found that of 11,131 carcinomata observed in the Vienna Hospital but 66 affected the bladder. The relative frequency of benign and malignant bladder growths is differently estimated by writers on this subject. Thompson found 40 of 100 bladder tumors were malignant; Pousson 67 in 205; and Barling

FIG. 371

Epitheliomatous mass springing from posterior wall of bladder. (After Fenwick.)

86 of 201. Targett says 40 per cent. and Weir 80 per cent. are malignant. As to the relative frequency of sarcoma and carcinoma of this organ, Spurling says the proportion is 13 to 49; and Wendel found but 6 sarcomata to 40 carcinomata. In children sarcomata greatly preponderate.

Epitheliomatous papilloma can only be distinguished by the microscope. Oftentimes a careful physical examination will determine whether the base or pedicle of a bladder tumor is malignant, as thickening and induration about the base is usual.

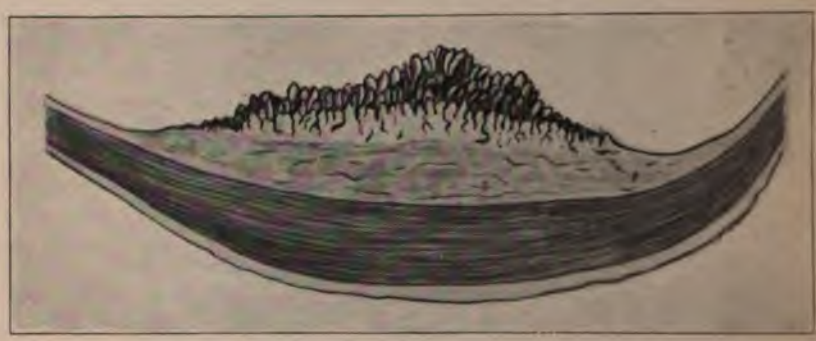
However, because of the absence of such conditions one cannot state malignancy has not begun nor even that a malignant tumor of the kidney

or bladder is not present, even though the bladder papilloma is microscopically benign. There is apparently a shortening and thickening of the pedicle progressive with malignant degeneration of bladder papillomata.

Symptoms.—The clinical history of the malignant bladder growth is similar in the early stages to that of benign ones. Later, however, enlargement causes pressure on surrounding structures with consequent symptoms and cachexia, and, in some cases, perforation or secondary involvement.

Treatment.—This is of limited usefulness. Probably a few malignant tumors of the bladder are removed early with eradication. In these the diagnosis is usually tentative. The operation should never consist of less than bladder resection and urinocystectomy for malignant neoplasm of the bladder has been done 21 times with 11 deaths. In 7 the ureters were grafted into the rectum (one by a Maydl operation) with 5 deaths

FIG. 372



Carcinoma of bladder wall. The section shows the villus-covered surface, the infiltrated submucosa, and the infiltrated and hypertrophied muscularis

from failure of graft, shock, pyelonephritis, and renal infection. In 2 sigmoid grafts were made with 1 death from pyelitis. In 7 the graft was made into the vagina with 2 deaths from collapse and peritonitis. In 2 skin implantations, 1 died of shock and the other suffering from pyelonephritis was well four months later. Two urethral grafts were made, 1 dying from shock and the other from urinary obstruction.

With a primary mortality of 52 per cent. urinocystectomy for malignant bladder disease is a formidable operation.

In the very radical operations for uterine cancer, practised during the past nine years, the primary mortality is but 15 per cent., and by many surgeons such procedures are condemned.

The failure of the ureteral grafts and the great tendency to recurrence make the percentage of cures in urinocystectomy for malignant disease very small, and necessarily limit materially its indications. In fact, its application is therefore much more limited than resection or partial exsection of the bladder.

TUBERCULOSIS.

Like the kidney, this organ may be the primary site of tuberculosis. Rovsing has insisted that unless some form of cystitis exists the tubercle bacillus cannot possibly create tuberculous cystitis. Ultzmann states that it often complicates gonorrhœal and other forms of cystitis.

While it may exist as a feature of general tuberculosis, yet it is probably most frequently associated with a similar involvement of the kidneys. In the early stages there is an intense catarrhal condition usually intensified in various places. Later in the progress of the disease in the reddened field are noted small white nodules, which break down, forming ulcers of various sizes and having ragged and irregular margins. The condition may gradually spread throughout the bladder, but the dependent parts are most apt to be involved. These are the posterior wall and the trigonum.

The disease usually extends over a period of several years, though it may end fatally in a few months.

Symptoms.—The symptomatology is at first but that of acute cystitis, gradually becoming chronic and with increasing distress due to the frequent and painful micturition.

After a few months blood is noticed in the urine and pus becomes a constant component of it. When tuberculosis is general or the kidney is notably involved great emaciation is present, tubercle bacilli may or may not be found in the urine. In about half the cases the family history is distinctly indicative of tuberculosis.

Diagnosis.—Given a tuberculous family history and symptoms of cystitis, tuberculosis of the bladder should be suspected, and if the individual have tuberculous involvement of any part of the body little other evidence of the nature of the bladder infection is needed. In young women cystitis is usually due to the gonococcus or tubercle bacillus. If other evidence of gonorrhœal infection be absent and the gonococcus cannot be found about the urethra or in the urine, tubercle bacilli should be diligently sought in the urine. Frequent examinations must be made and, if necessary, small pieces of diseased tissue searched for them. Even when the gonococcus is found, absence of the tubercle bacillus should not be assumed, as they are commonly associated in this field. Nor can the presence of tubercle bacilli in the urine be considered as absolute proof of tuberculosis of the urinary tract, as many investigators have found this bacillus in the urine unaccompanied by symptoms and in which no subsequent symptoms developed.

Treatment.—In early stages of the disease, particularly when it is localized, treatment offers fair prospects of being successful. The general condition of the patient must be carefully watched and improved by nutritious food in abundance, fresh air, light exercise, and, perhaps, changes of climate and surroundings. Topical applications of iodoform in the strength of 5 or 10 per cent. emulsions have been vaunted.

The silver salts act very nicely, as does lactic acid in 5 per cent. solution, though painful and requiring local anæsthesia.

Hunner says weekly and bi-weekly instillations of corrosive sublimate in solution of 1 : 10,000 to 1 : 5000 is best.

By means of the cystoscope topical applications become quite accurate and greater precision as to the area to be treated is possible. Should such means fail to cure then curettage or cauterization may become necessary. This, however, is more applicable if the tuberculous involvement of the bladder mucosa be limited to small areas. Should this prove ineffective the next more radical procedure is extirpation of the diseased area, but this cannot be done when large areas are involved, though excision of the whole bladder has been done three times and in all of them death finally resulted. F. H. Martin's patient died of suppression of urine twenty-six hours later. He implanted the right ureter into the rectum and the left to the skin.

In C. Beck's case both ureters were grafted into the sigmoid and, according to Peterson, death from bilateral pyonephritis occurred two years later. Trendelenburg removed the left kidney and bladder for tuberculosis of those organs and grafted the right ureter into the colon. Boari says the patient died of tuberculous peritonitis two years later.

This is a gloomy prospect for urinocystectomy for tuberculosis, and leads to the inference that severe surgical intervention for such severe lesions is rarely justifiable.

CALCULI.

Urinary calculi found in the bladder are composed largely of uric acid and its compounds, oxalic acid and oxalates, cystine, and phosphatic deposits.

They vary little in the central portions from calculi formed in the kidney and ureter except in those formed about some foreign body in the bladder when phosphatic deposit is the principal part of the calculus, if not constituting the only urinary material.

In children the tendency is to the formation of uric acid deposits, while in the aged it is to phosphatic calculi. But 5 per cent. of bladder calculi is said to be found in women, and but 4 per cent. in the colored race.

Size.—Bladder calculi vary in size from the smallest particle one could see with a naked eye to those several inches in diameter. One removed in this country weighed nine and a half ounces and was eight and a half inches in circumference.

Shape and Density.—The usual shape of bladder calculi is spherical or ovoid, flattened on a few surfaces and having facets if other calculi are present. Probably the shape of the bladder, the composition of the calculus, and the duration of its development markedly control the shape of the bladder calculus. The surface may be smooth or roughened.

Causes.—Other than just mentioned local and general diseased conditions predispose to the formation of bladder calculus. Any condition of the urethra, such as stricture or enlarged prostate gland, pressure from new-growths or foreign bodies, that will prevent complete emptying of the bladder will promote formation of bladder calculi. A similar result may be expected when atony of the bladder wall, pressure from uterine fibroids, or bladder adhesions to rapidly growing ovarian or uterine tumors are present. The presence of a vesicovaginal fistula promotes phosphatic deposits which may continue into the bladder.

Symptoms.—There is usually nephritic or ureteric colic with passage of a calculus. This may be very slight if the ureter offers little obstruction to the passage of the stone.

Other symptoms that are presented while the calculus is in the bladder are pain, frequent urination, sudden interruption of the stream during urination, hæmaturia, pyuria, and reflex pains.

PAIN.—The pain is localized in the bladder and urethra and is essentially of a darting and burning character. It is severe during micturition and intensest just at the end of the act. This is explained by the sensitive bladder mucosa being brought into direct contact with the surface of the stone, and is worse if the stone has a roughened surface. If much atony or bladder paralysis be present pain is of much less intensity.

FREQUENT MICTURITION.—This is more marked by day than by night. Urination may be every few minutes with a sudden and irresistible desire. It is exaggerated by active motion, such as walking or riding over rough roads. If the surface of the stone is rough or mobility in the bladder is extensive this symptom is more marked. It is also more marked in the young than in the aged.

SUDDEN INTERRUPTION OF THE STREAM DURING URINATION.—When bladder calculus is small it is easily swept along to the outlet, completely obstructing it. The patient soon learns some peculiar position she can assume in urinating that will cause the stone to gravitate away from the urethral orifice and thus secure satisfactory emptying of the bladder.

HÆMATURIA.—This symptom is common to the presence of tumors and several other conditions independent of the presence of calculi, and hence is of importance in calculi only as it is associated with other symptoms.

It is produced by friction between the stone and the vesical mucosa, and hence is worse when the surface of the calculus is rough. It is worse after exercise and is particularly noticed at the end of urinating.

PYURIA.—This occurs when cystitis is a complication of calculus, a very common occurrence.

REFLEX PAINS.—This is commonly noted in the perineum and the rectum, but has been observed in the stomach and particularly in the lower extremities and back.

Diagnosis.—The group of symptoms enumerated are strongly suggestive of bladder calculus, but a careful examination of the bladder

must be made to determine whether a calculus is present. Bimanual examination will usually detect the presence of the larger calculi, but small ones readily escape discovery by this plan. A metal sound passed into the bladder will give a peculiar click that is readily recognized by the ear, and the touch readily conveys an impulse to the hand holding the sound.

If the stone has become covered by mucosa—encysted, as it were—this evidence will be lacking. In such condition the cystoscope shows an irregularity in the bladder outline, and a careful bimanual examination under general anæsthesia will usually reveal the hardened enlargement. Proper allowance for bladder diverticula must be made.

Treatment.—The prophylactic treatment is of great importance, and consists of proper regulations of the diet, especially to control the condition of the urine that tends to the formation of calculi. This presupposes careful urinalyses to discover which salts that form calculi are in excess. If calculi have previously formed then a careful examination of them will correctly guide one in guarding against elaboration of an excessive amount of the same salts in the urine.

Reaction of the urine has a special influence on the formation of vesical calculi. However, when calculi have formed in the urinary tract one can never feel sure they will not again form or that some formed but quiescent are not discovered.

The principal treatment, however, is surgical. In the female the urethra may be dilated and smooth stones up to three-fourths of an inch in diameter removed. With forceps or by litholapaxy rough stones and practically any can be removed through this canal. Since surgical technique has been so much improved the field of litholapaxy has narrowed and it has been succeeded by vaginal or suprapubic cystotomy. These operations give excellent results in careful hands. The condition of the bladder and of the urine should be carefully studied with a view to efficient drainage being established. Opium, belladonna, and other analgesics may be required for pain.

OPERATIONS ON THE BLADDER.

These are curettage, cystotomy, repair of vesicovaginal fistula, creation of temporary vesicovaginal fistula, ureterocystostomy, resection, and exsection.

Curettage.—This consists of the removal of portions of the vesical mucosa, either when done as a distinct procedure, through the urethra or through vaginal or suprapubic cystotomy wounds. It is done to remove diseased tissue that has resisted treatment by other means. Among these may be mentioned some forms of tuberculous inflammation and ulcers. After the tissue is detached under anæsthesia by the curette it is carefully washed out by sterile salt solution and the bladder drained for a few days. The reaction of the urine should be maintained neutral or faintly acid and a non-nitrogenous and non-alcoholic diet maintained.

Cystotomy.—Incision into the bladder is an operation usually made for purposes of exploration or drainage. It is occasionally made accidentally during the performance of some other surgical operation. It also enters into ureterocystostomy described in the chapter on Diseases of the Ureter. Before bladder irrigation, and especially cystoscopy, were so

FIG. 373

Colostomy for intestinovesical fistula: *A*, artificial anus; *B*, bladder; *C*, director passed through fistula; *D*, rectum laid open; *E*, anus.

systematically and aseptically employed vaginocystotomy was very commonly employed in the treatment of chronic cystitis and various obscure conditions of the bladder. It has become practically a forgotten feature in such conditions, owing to the danger of ascending infection and the greater precision in diagnosis by cystoscopy. For the removal

of large vesical calculi it is the preferable route of entrance to the bladder of the female. If the calculi are extremely large or if tumors are located high in the bladder wall the suprapubic route will generally be required.

FIG. 374

Tenaculum for drawing bladder into abdominal opening in suprapubic cystotomy.

Repair of Vesicovaginal Fistula.—Repair of vesicovaginal fistula is carefully considered under the head of Vaginal Fistula.

Creation of Temporary Vesicovaginal Fistula.—The creation of temporary vesicovaginal fistula was formerly done, as mentioned above, for

FIG. 375

Guyon's pedicle clamp.

FIG. 376

Fenwick's pedicle clamp.

bladder drainage. Great difficulty was experienced in keeping the fistula patulous. Should this operation ever be required this difficulty is safely met by making an incision through the anterior vaginal wall into the bladder longitudinally in the median line and by means of a

few interrupted fine catgut sutures carefully approximating the vesical and vaginal mucosæ.

When closure is to be made a transverse splitting of the flaps is easily made and like tissues of the two flaps sutured together, avoiding penetration of the vesical mucosa by the sutures.

Ureterocystostomy.—Ureterocystostomy has been considered in the chapter on Diseases of the Ureter.

Resection of the Bladder.—This operation is required for the removal of new-growths, either primary or secondary, invading the bladder wall. In suitable cases it gives excellent results. In fibroma, fibromyxoma, and early stages of malignant tumors of the bladder wall it is indicated. Frequently a ureteral orifice or even both are involved in the diseased process, and both ureters have to be severed and implanted into the remaining healthy portion of the viscus. Generally speaking, the operation is not applicable to the portion of the bladder adjacent to the internal urethral orifice, owing to the great difficulty of properly joining the urethra to the remainder of the bladder and retaining the function of the sphincter vesicæ muscle.

A considerable portion of the bladder may be removed if necessary and subsequently dilatation be employed to increase the capacity of the organ. The suprapubic route is by far the preferable one.

Excision of the Bladder.—Considerable confusion has arisen from the many reported cases of bladder excision that were only resections. When a portion of the viscus is retained and the ureters grafted into it the bladder has been resected and not exsected. In my paper prepared for the American Gynecological Society in 1901, was a table of 100 cases of bladder extirpation. This comprised all the cases that were found by careful study of medical literature in the library of the Surgeon-General's Office in Washington. The conditions for which these were done were as follows:

Exstrophy of the bladder	68
Malignant disease of the bladder	21
Tuberculosis of the bladder	8
Epispadias	1
Uterine fibroid	1
Conditions not noted	6

To these as indications for the operation may be added diffused growths of the bladder, multiple or very large benign bladder tumors, especially when invading the trigonum or ureteral orifice, and papillomata and myomata that involve practically the whole of the bladder wall. In malignant disease the operation is indicated when the disease is limited to the bladder wall or possibly involving the prostate in the male. Fortunately, the lymphatic distribution of the bladder is such that extension of the disease, in case of malignancy, is very slow. According to Haggan the lymphatics are very small, do not enter the mucosa, and act very sluggishly. They pass out at the neck and urachus; as contraindications to the operation may be suggested generally bad condition of the individual, and especially if the prospects of cure of the

condition are not bright. In tuberculosis that is clearly general, or in a region inaccessible from a surgical standpoint, and when malignancy has ceased to be confined to the bladder, the operation is not indicated. Old age and childhood act as contraindications, except exstrophy of the bladder in children. When cancer has invaded the uterus from the bladder or the reverse it should not be done.

ROUTES.—For exstrophy of the bladder no special necessity arises for any particular route. Often a cleft in the pubes renders the field more convenient, but for all other conditions this feature is important.

In some cases the vaginal route may be employed, provided implantation of the ureters is to be into the vagina or the urethra, or even separately into the bowel. It is impracticable for the Maydl or Pozza methods of ureteral grafting when the uterus is present unless one ureter be unusually stretched to pass to the other side, and this is well-nigh impossible. The suprapubic or extraperitoneal route renders extirpation easier. The bloodvessels are more readily approached by this route. Bardenheuer prefers a curved incision, with its concavity toward the pubes, extending from one inguinal canal to the other. This incision passes through the whole of the abdominal wall except the peritoneum. Others prefer a vertical median incision of about three inches just above the pubes, more space being secured, when needed, by a transverse incision crossing the lower end of the vertical one. This has been combined by some with symphysiotomy, which is rarely needed in women. The operation may be completed at one attempt, or after Pawlik, at different times.

After dilating the urethra sufficiently to admit passage of the index finger, washing out the bladder thoroughly with a saturated solution of boric acid and thorough sterilization of the vagina, vulva, and hypogastrium, Mann proceeded as follows: The abdomen was opened by an incision extending down to the symphysis and the patient put in the Trendelenburg posture. The peritoneum was cut from side to side across the fundus of the bladder and stripped away from the bladder wall by the finger tips. The bladder was then separated from the front wall of the pelvis as far down as the neck. After it was all loosened, except at the base, the neck was tied and cut with the scissors, the finger introduced into the urethra, being used as a guide. The incision was carried through the anterior vaginal wall, which was pulled up into view by dragging on the bladder. The incision was then continued around the bladder, severing the ureters just as they enter the bladder wall. This step was aided by a finger in the vagina.

He made no attempt to graft the ureter into any structure relying on vaginal drainage. The peritoneum was then carefully closed.

DISPOSAL OF THE URETERS.—This is an important feature of urinocystectomy. In the 100 cases mentioned the ureters were grafted separately into the bowel 31 times and by the Maydl and Pozza methods 44 times. They were grafted into the urethra 13 times, into the vagina 8 times, and 4 times to the skin. Peterson found of 44 dogs operated on by grafting of the ureters into the large bowel, 36 died. Bacterio-

logical and pathological examination of the ureters and kidneys of the 8 surviving animals, made by Zeit, proved all of them to have been the victims of ascending infection.

On man 13 deaths occurred among the 31 cases, 7 of which were clearly due to ascending infection. Others died subsequently, even at the end of two years, from the same cause.

The Maydl operation, consisting of grafting both ureters with a portion of the bladder, all in one piece, into the rectum, was done 40 times. Of these but 2 died of infection.

A modification of this method, consisting of the transplantation of a large amount of bladder mucosa and the ureters separated by a vertical median incision, with separate grafts of the ureters, has been done 4 times in Italy, all successfully.

These two methods are obviously rarely applicable in malignant bladder disease, but are the best for bowel grafting of the ureter. The Mauclaire-Gersuny plan of making a separate bladder from a portion of the bowel seems plausible. The bowel is severed at the junction of the rectum and sigmoid. The cut end of the rectum is inverted and closed with sutures. Into this portion the ureters are grafted and the upper cut bowel end is brought into the sphincter ani muscle. While very ingenious, it has not been employed in the human.

In the 10 cases of skin implantation of the ureters, 4 died in a short time. In 2 kidney infection with nephrectomy was done, and in 4 no record is given. This method was fully as unsuccessful as bowel grafting. In 8 cases vaginal grafting was done, with one death. Two deaths occurred in the 13 cases in which urethral grafting, the Sonnenburg operation, was done. No doubt the Maydl or the Pozza methods are best.

RESULTS.—Of the 100 cases tabulated 27 cases died, either from the operation or subsequently from infection.

CHAPTER XXX.

AFFECTIONS OF THE URETHRA OF THE FEMALE.

By J. WESLEY BOVÉE, M.D.

THE urethra of woman having a less tortuous direction, less associated with generation and shorter than that of the male, is less subjected to ailment. Moreover, its protected position close under the pubic symphysis and the shielding afforded it by the thighs and labia still further lessen the liability to injury of it. Its close relation to the vagina and vulva, however, subject it to injury during coitus and parturition.

The vulva is normally infested by micro-organisms, however, and the urethral meatus is constantly in danger of infection from this source. The solid non-resisting pubic arch, while acting as a defensive bulwark from above, increases the danger of injury to the urethra from below because of the lessened mobility of this canal.

The affections of the urethra may be conveniently classed under two heads, viz.: Modifications of the calibre, and interference with the function.

For practical consideration they may be considered as malformations, displacements, dilatation, stricture, fistula, foreign body, new-growths, urethritis, and injuries.

MALFORMATIONS.

Urethral malformations may be acquired or congenital. The acquired form may arise from the acute exanthematous diseases and traumatism. Apart from those traumatisms resulting from parturition, and which will be considered under the head of injuries, this class is very small.

Congenital malformations are also very rare. They are, as a rule, deficiencies of development of some portion of the urethra. The principal ones are hypospadias, epispadias, imperforate urethra, and absence of the urethra.

Hypospadias.—In hypospadias some portions of the under surface of the urethra, usually the outer portion, is absent and the external meatus is to be found in the anterior vaginal wall.

In these cases, should annoyance from urine passing through the vagina or other symptoms arise, a plastic operation may be made to remove the defect in development.

Epispadias.—In this condition there is a defect in the upper side of the urethra, and usually a cleft through the clitoris and labia. Sometimes this is exaggerated into a type of exstrophy of the bladder.

Imperforate Urethra.—Imperforate urethra results from agglutination of the urethral canal before birth, but may be associated with other congenital anomalies of development that have begun early in the formation of the fetus; some aberrant canal usually substitutes for the closed urethra. Patulous urachus with umbilical exit is one of these. Should no such exit be afforded the fetus is subjected to dilatation of

FIG. 377

Hypertrophy of urethral mucosa at meatus

the bladder, ureters, kidneys, and perhaps serous cavities by urine and effused fluid. Death of the fetus may result and difficult delivery of the same is to be expected.

ABSENCE OF THE URETHRA.

In this class of congenital maldevelopment the urethra is entirely absent and the bladder and vagina join.

DISPLACEMENT OF THE URETHRA.

The whole or part of the urethra (the mucosa) may be displaced. The whole of the urethra may be displaced when the bladder is prolapsed, and especially if procident uterus is present. The urethra is carried endwise in the arc of a circle about the pubes. The posterior portion is pushed downward and forward and the external orifice upward and forward. At times the canal is tortuous or sigmoid. In this con-

FIG. 378

Operation for relief of hypertrophy of mucosa at meatus urinarius.

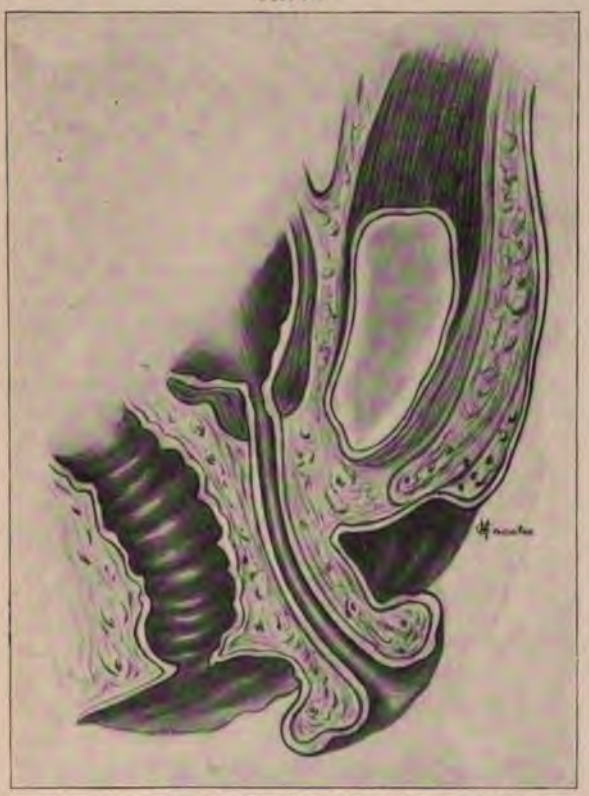
dition interference with micturition is noticed. Retention is the usual difficulty, though this may be associated with frequency of and lack of control of urination. Later decomposition of residual urine may occur. From the presence of uterine tumors of prodigious size, particularly if adherent to the bladder, the bladder may be carried up to the umbilical level, or even higher. Even when the tumor does not extend so far toward the diaphragm, if it pushes forward markedly it carries the inner end of the urethra with the bladder upward and forward in the opposite direction in the circle from that produced by the downward displacements.

During parturition either of these forms of displacement may occur, depending upon the direction of pressure of the presenting part and the degree of bladder distention.

In these displacements of the urethra great difficulty in catheterization is often experienced. I have found it impossible in some cases with the patient on the operating table except by traction on the tumor in certain directions with a hand in the abdominal cavity.

Kelly (*Operative Gynecology*, vol. ii. p. 290) mentions a case coming within his knowledge in which, on account of the displacement, a doctor passed a catheter through the wall of the urethra into the presenting head of a fetus.

FIG. 379



Hypertrophic descent of meatus urinarius shown in section.

DISPLACEMENT OF THE MUCOSA.

Displacement of the mucosa is quite a rare affection that occurs at all ages, principally in young children and in the aged. It is usually produced by straining during micturition, injury, and inflammation of the affected part. It is to be distinguished from caruncle by the color usually being more subdued and rolling out from the meatus in every direction, while the caruncle is usually located to but one side of the orifice. Its base is farther back in the canal than the caruncle and is broader than the pedicle of a urethral polyp.

Treatment.—The treatment is reposition after local application of adrenalin solution, a well-fitting compress with rest in bed, and if pain persist vaginal or rectal suppositories or belladonna and hyoscyamus, and, if necessary, morphine should be employed.

Morphine should be avoided if possible, as vomiting and vesical insensitiveness may result, both of which lead to straining to void urine. This latter should be avoided for a few days even if catheterization be required as a preventive measure.

In a young lady I recently treated it became necessary to excise the redundant mucosa and to close the wound with a running catgut suture drawn fairly tight. It was an exaggerated case.

DILATATION.

Dilatation of the urethra of the female is a rare occurrence. It is always caused by traumatism.

Injuries in childbirth or from penetrating wounds, caused by falls upon hard objects, are the principal causes from without. While from within the two great causes are divulsion by the removal through it of some large object, such as a vesical calculus and coitus *per urethram* in vaginal atresia or resisting hymen. The latter is possibly the most prolific cause. Divulsion for bladder examination has been found to be responsible for a few cases. It may vary from the leakage of a few drops with some special exertion as coughing or sneezing to a practical failure of control of the passage of urine.

Treatment.—Absolute rest in bed should be the first treatment to be employed, unless laceration of the urethra is plainly discernible, in which event careful cleansing and suturing should be done. Should this fail, then one of the following four procedures may be tried:

1. The application of a vaginal pessary.
2. An operation to restrict the calibre of the external meatus.
3. Twisting the urethra spirally to narrow its calibre.
4. A longitudinal resection of the anterior vaginal wall, perhaps including the urethra.

Should the cicatricial tissue be found distorting the canal by traction, this should be removed and the tension abolished. If the condition be slight and limited to the outer portion of the canal the second plan mentioned should be the preferable one and the sutures should be interrupted. Pawlik has succeeded well with this procedure. For more extensive cases the fourth plan mentioned should be most satisfactory.

A longitudinal strip of the anterior wall of the vagina, extending from the external urinary meatus too close to the internal meatus, is removed and from this the denudation is carried back over an elliptical area extending quite beyond the junction of the bladder and the urethra. The flap should be so shaped as to leave a trough-like denudation with the bottom formed by the urethral mucosa. In some cases removal of

a strip of the mucosa will be necessary. The wound is now closed by interrupted catgut sutures, which should not penetrate the urethral mucosa. Permanent catheterization should be used for about two days, after which it may be limited to regular intervals.

The plan of Gersuny, mentioned as the third plan, requires very careful work, and if it fails leaves less opportunity for some other procedure. It consists of dissecting the whole urethral canal from the surrounding structures as far back as the bladder, twisting the urethra upon its longitudinal axis, thus forming a number of special folds, and suturing it in that position.

Schatz devised a funnel-shaped pessary which, introduced into the vagina, presses directly upon the urethra and it in turn against the symphysis pubis, thus holding the urine a considerable time. This necessitates a very careful adjustment of the pessary and good vaginal walls to maintain the adjustment.

STRICTURE.

Stricture of the female urethra may be produced by tuberculosis, syphilis, carcinoma, gonorrhœa, and cicatrices from traumatism. Little relief can be expected in this condition except it be produced by either of the last two mentioned causes, unless by the creation of either a vaginal or suprapubic outlet from the bladder. Gonorrhœal stricture may be either dilated or excised, and cicatrices from traumatism may be excised, divided or dilated.

URETHRAL FISTULA.

Urethrovaginal fistula may result from pressure of the fetal head in a prolonged second stage of parturition. It is in this case usually located near the bladder and may be associated with vesicovaginal fistula.

It may also result from carcinoma, syphilis, or tuberculosis, involving the anterior vaginal wall. There is leakage of urine into the vagina during micturition, and if located near the bladder frequent leakage may occur at other times. When due to traumatism it is amenable to surgical treatment, which consists of proper denudation and suturing, avoiding the urethral mucosa. If associated with vesicovaginal fistula the operation should include closure of that fistula at the same time. Sometimes the first operation fails.

FOREIGN BODIES IN THE URETHRA.

This is a very rare condition. They may be introduced from without or from the bladder, as lodged calculi, or from within the urethra itself. When passed from the bladder or formed in the passage they are

quite apt to be phosphatic calculi. When introduced from without they may be hairpins, pieces of wood, and if these remain for but a few days they become encrusted with phosphates.

Symptoms.—Frequent and difficult micturition or complete obstruction to the flow of urine are noted in this condition. The urine may be alkaline and contain pus, blood, or mucus.

Diagnosis.—Vaginal examination reveals the presence of a mass in the urethra, as felt by the finger. A catheter introduced into the urethra reveals the nature of the condition.

FIG. 380

A form of urethral caruncle.

Treatment.—A finger introduced into the vagina may press against the mass on its proximal side and a milking or kneading process be sufficient to force it out from the urethra. Failing in this, a small curette may be introduced into the urethra with the vaginal finger fixing the body, and it may be broken up or pulled out whole. If this be unsuccessful, then it may be grasped by forceps. Should this fail vaginal urethrotomy may be safely done. Closure of the wound by sutures should follow extraction.

NEW-GROWTHS.

Of these caruncle, fibroma, sarcoma, and carcinoma are found; of these the first and last are most common and the other two are very rarely found.

Caruncle.—Urethral caruncula are small vascular tumors of the external urinary meatus usually situated on the posterior or postero-lateral portions of the margin and attached by narrow bases. They are soft, pinkish, or deep red in color, and excessively painful to touch.

FIG. 381

A form of urethral caruncle.

They are composed of connective tissue and hypertrophied papillæ with numerous dilated bloodvessels and covered with pavement epithelium.

Symptoms.—As a rule intense pain accompanies urination. Voluntary retention of urine for long periods of time to avoid this pain is usual, though rarely little discomfort accompanies presence of the growth in some cases. Usually intense suffering is entailed when anything is brought in contact with the growth. Sometimes slight hemorrhages are noted.

Treatment.—The growth should be removed completely, either by excision and suturing, or by the electrocautery under cocaine anæsthesia. If the pedicle be broad, then careful urethral dilatation should precede excision and general anæsthesia will be needed.

Fibroma of the Urethra.—These growths are extremely rare and are confined almost exclusively to infants and children. Excision is the proper treatment.

Sarcoma of the Urethra.—This, too, is an extremely rare form of urethral growths. The reported cases have, as a rule, been in women of advanced years. Could this variety of tumor be seen sufficiently early excision might be attempted, but as it is of rapid progress in almost all portions of the body, little hope of cure can be offered in urethral sarcoma.

Carcinoma of the Urethra.—This is far from common and exists either as a primary cancer of the urethral mucosa or as a periurethral tumor with invasion of the urethra, but not of the mucosa. Apparently in all reported cases of the periurethral variety the lumen of the urethra has been encroached upon by invasion by the new-growth from the vestibule or the vagina, but in none but Kelly's case, which developed some time after a radical operation for uterine cancer, was there any evidence of the mucosa of the urethra being involved. Even in this case it is not clear.

Treatment.—When seen early the primary variety should be removed along with a considerable portion of the urethra. This may be done by the knife, or preferable by the galvanocautery. When the invasion is secondary little hope of eradication can be secured. The galvanocautery is here again the best remedy, as it deters the spreading of the affection and destroys without hemorrhage all tissue that can be safely removed.

Morphine, hyoscyamus, belladonna, cannabis indica, and gelsemium are the best remedies for pain accompanying cancer, and their use should be carefully studied in every case of pain from cancer. They are best employed in suppositories.

Cleansing douches may become necessary, and for these lysol and permanganate of potash will be most satisfactory.

URETHRITIS.

This is a very common affection, though many times it is diagnosed as some bladder disease. It is, in a large majority of cases, due to the gonococcus. It may be caused by a foreign body, by prolapse of the mucosa, and friction from masturbation. It may be acute or chronic, the later variety usually existing as a sequel of the former. As the recesses of the urethra, especially Skene's glands at the external orifice, are prone to continue the diseased process, it is often found here years after the symptoms of gonorrhœal vaginitis have disappeared. Sometimes traces of the disease are found in the vagina, vulvovaginal glands and ducts, and the cervical canal. Perhaps a history of gonorrhœal endometritis and salpingitis is obtainable. In chronic gonorrhœal urethritis a milky pus can often be pressed out of Skene's glands by a finger pressing upward and forward under the urethra. Even the

screwing of a trivalve speculum in the vagina will cause an outpouring of it. It has been satisfactorily demonstrated that an acute attack may be excited by a quite latent gonorrhœal urethritis.

Symptoms.—In acute urethritis a sense of burning, painful urination, and frequent smarting, if much swelling exists, accompanied by straining, are present. If gonorrhœal, œdema may be present and symptoms of vaginitis and vulvitis complicate. An examination reveals a red pouting, and highly sensitive meatus bathed with yellow pus. The chronic form of disease exists as a diffuse or a localized condition. The former, which is common in prostitutes and very prone to promptly follow an acute attack, consists of a diffuse swelling about the anterior

FIG. 382

Drop of gonorrhœal pus squeezed from orifice of Skene's gland, showing focus of infection in chronic urethritis.

portion of the urethra, seldom involving the posterior portion, and by the formation of small pus collections in Skene's glands. There is considerable œdema or infiltration of the mucous membrane of the affected portion resulting in a livid coloring of it. The disease tends to advance and recede over various areas of the anterior urethra.

In the localized form the disease is noted in small circumscribed patches, almost punctate, of deep red mucosa near the external or the internal meatus, cicatricial tissue to a small extent may form, and the calibre of the urethra is correspondingly decreased. In chronic urethritis the symptoms are apt to be limited to tenderness and swelling about the external meatus, occasional smarting in urination with frequent micturition; all of these symptoms being exaggerated by active exercise, unusual indulgence in alcohol, and sexual intercourse.

Diagnosis.—This is based upon the history and a careful examination of the external meatus, and in chronic forms of the urethra by the urethroscope. If the stripping process, employed by a finger under the urethra, causes pus to escape from the meatus, pain or unusual tenderness or appreciable thickening about the outer portion of the canal, urethritis may be certainly diagnosed. Microscopic examination of the pus may demonstrate the presence of gonococci.

Treatment.—During an acute attack of urethritis the treatment should consist of rest in bed and restriction of diet to the very blandest. Milk and water should be taken freely. All remedies and food that irritate the urinary and genital tracts should be interdicted. Sedatives to the urinary system, such as belladonna, hyoscyamus, and buchu are applicable. Hot vaginal douches and vaginal suppositories, as well as lead and opium lotions, may be required. In exaggerated cases opium in suppository may be required. When the inflammation is of the chronic form applications of 2 to 5 per cent. solution of nitrate of silver twice a week are of great value. If much swelling is present adrenalin solution will in some cases cause sufficient shrinkage of the mucosa to allow the silver solution to more fully reach the recesses. In very sensitive and nervous women cocaine solution should be previously applied.

The glands of Skene should be gently evacuated daily if convenient. As a rule, these glands will require being liberally incised and cauterized with lunar caustic or tincture of iodine energetically applied. Application of ichthyol of about 10 per cent. strength may be applied to the urethra and vagina.

INJURIES OF THE FEMALE URETHRA.

Injuries of the female urethra are due to traumatism incurred in accidents, as falling a long distance and landing on the perineum on some resisting object, improper technique in symphysiotomy, in urethral and bladder exploration, and in parturition. The introduction of foreign bodies from without, usually in erotics, or calculi from the bladder are known causes. In these injuries, due to parturition, the injury may give evidence of its presence at once or only after several days when a slough has occurred. The injuries may vary in degree from slight laceration to practically complete destruction of it.

Symptoms.—The symptoms are localized pain and hemorrhage in laceration with urinary leakage, especially if the injury reaches to near the bladder. If sloughing without laceration occurs the first symptom may be urinary leakage through the vagina accompanied by soreness. Injury of the bladder will likely have been produced at the same time and consequent dribbling of urine be present.

Diagnosis.—The diagnosis is based upon the history of a fall, parturition, a forcible urethral dilatation or an injury, the symptoms mentioned, and a careful specular examination.

Treatment.—The treatment depends upon the degree and character of the injury. If but slight fissures are made they may heal sufficiently well by rest in bed to require no other treatment. If the urethrovaginal septum be split it should be sutured, preferably at once, unless the danger of infection or the amount of contusion be great. Under such conditions antiseptic douches should be employed, one to five times daily, until the dangers are passed and the wound has healed.

If deformity result a secondary operation may be done.

When the urethra has been torn away in larger part or *in toto* some plastic operation must be devised to reform it from the vaginal walls. This is the less difficult if the bladder exit gate be intact. A urethra may be made by one or two flaps sutured over a catheter fastened in proper position for the urethra.

If the scar tissue in the anterior vaginal wall be great, as oftentimes is the case in obstetric cases, this procedure is apt to be unsuccessful and the posterior vaginal wall must be utilized for the purpose.

If the bladder be also injured to the extent of urinary leakage the operation becomes still more difficult and often ends in failure. In fact, this special plastic surgery ranks well with that of the ureter for brilliancy and success or failure.

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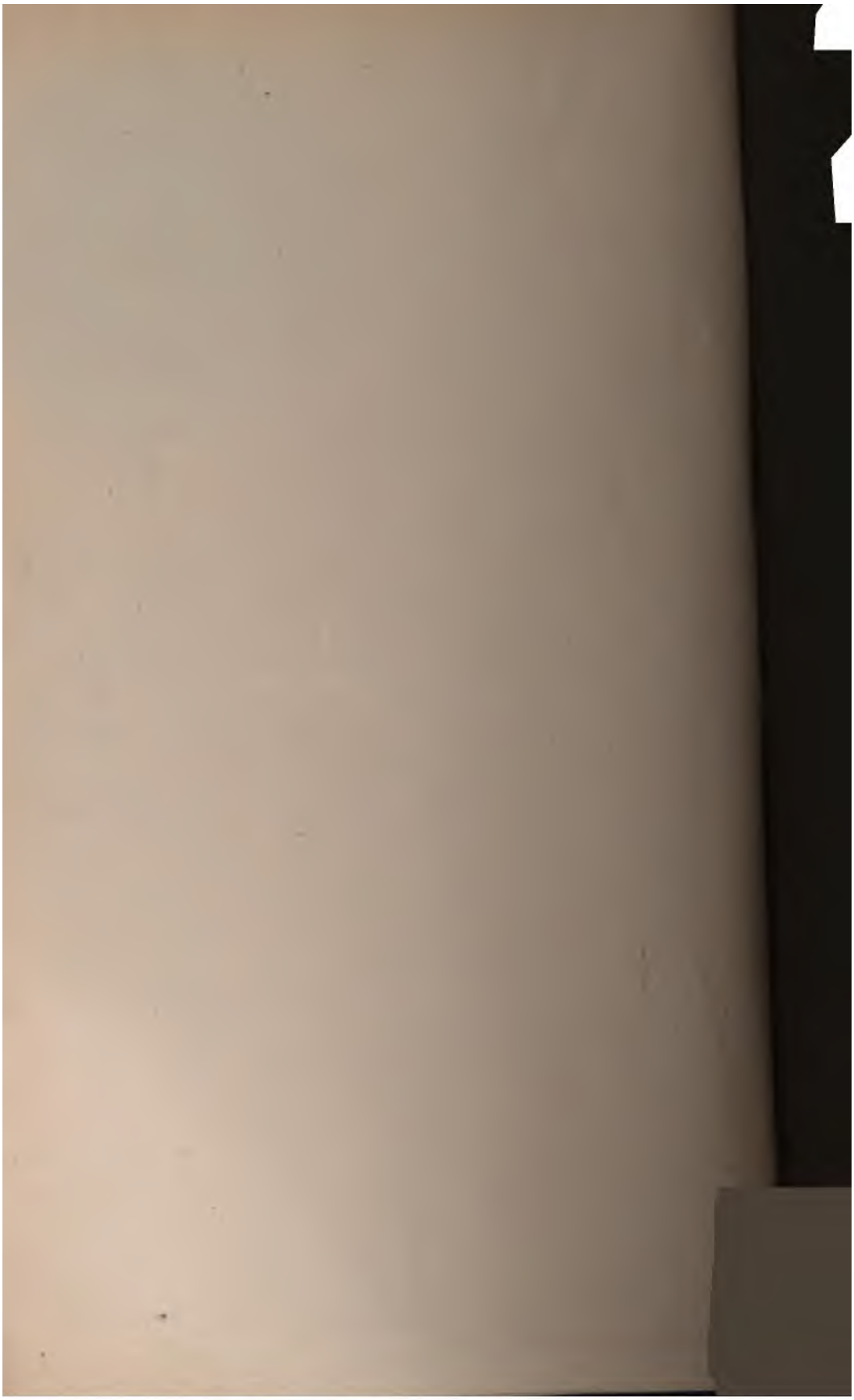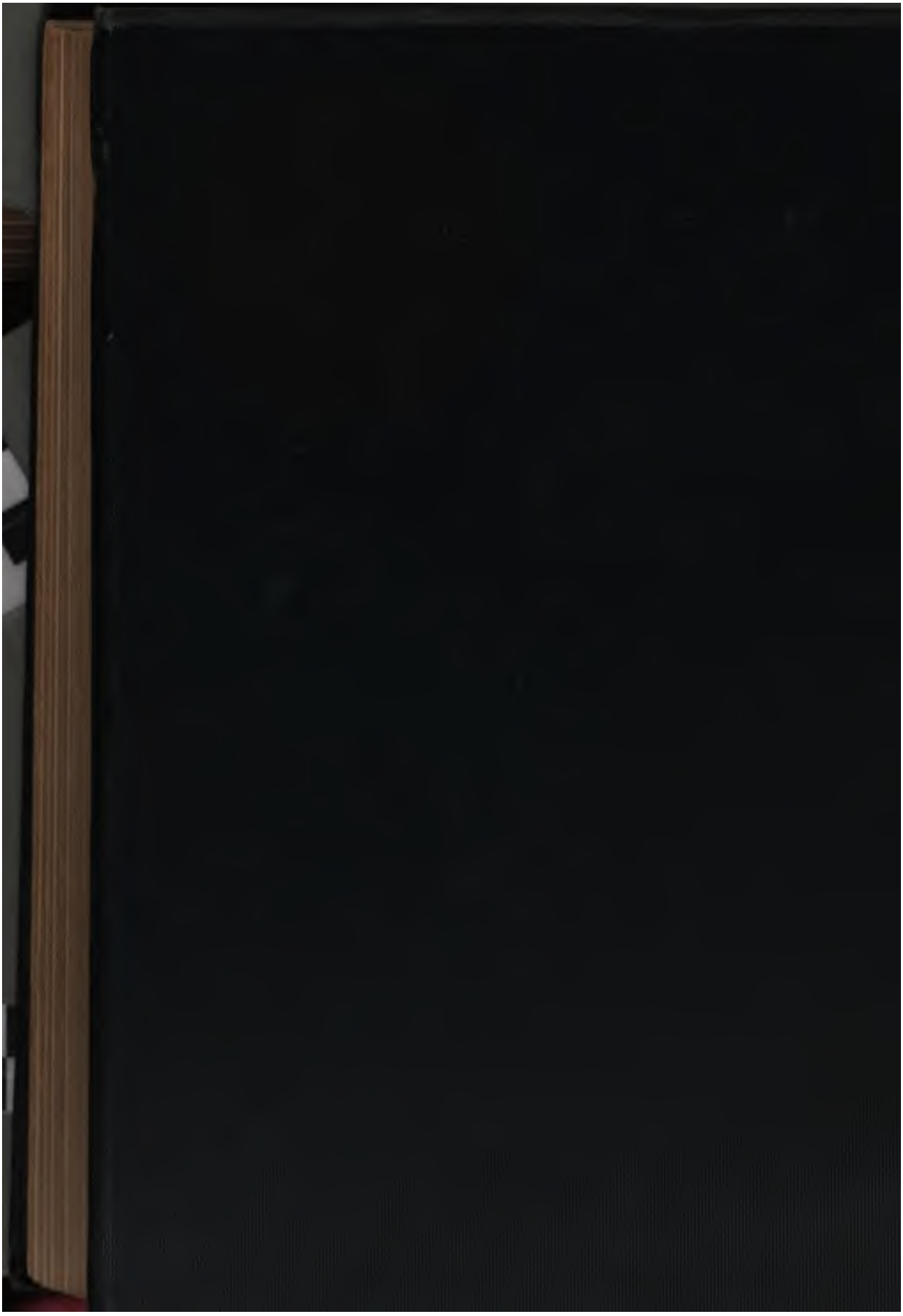
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